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STUDIES OF RIPENING OF SUGARCANE IN LOUISIANA AND OF EFFECT OF TOPPING UPON YIELDS OF CANE AND SUGAR PER ACRE

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INTRODUCTION

Under the limitation of a comparatively short harvesting season and the consequent need for beginning to harvest sugarcane at the earliest feasible date in the fall, adequate information on ripening qualities of different varieties of cane is desirable. Knowledge of the extent to which the immature top portion of the stalk must be discarded in order to secure cane of suitable quality for milling is essential, especially in the case of cane for early harvesting, in the interest of permitting best utilization of the varieties which are grown commercially. Such information was generally available regarding the varieties now discarded, which had long been grown in Louisiana, but it is not applicable to the new disease-resistant varieties now almost exclusively grown, the characteristics of which differ extensively from those of the old varieties. Further, many of the new varieties have not been in commercial culture long enough to allow planters to acquire by experience an understanding of their innate ripening qualities and their fluctuations in response to the different characters of seasons. This is particularly true of Co. 290, which was introduced into commercial culture in the fall of 1933, and of C. P. 28/19, which was introduced in the fall of 1934. It is also true to a large extent of Co. 281 and C. P. 807, which were introduced in the fall of 1930.

In view of the importance of adequate information on the subject, both with respect to its immediate applicability and in connection with the breeding and development of earlier maturing varieties of cane, the Division of Sugar Plant Investigations of the Bureau of Plant Industry undertook extensive studies beginning in 1932.

[1] Acknowledgment is made to S. F. Sherwood, senior biochemist, Division of Sugar Plant Investigations, for assistance in planning details of the experiments and for aid in the preparation of the manuscript, and to I. E. Stokes, C. C. Krumbhaar, and R. B. Bisland, agents, Division of Sugar Plant Investigations, for assistance in connection with various phases of the experimental work.

Results of studies carried on at the United States Sugar Plant Field Station, Houma, La., during the harvesting seasons in 1932–33 and 1933–34 concerning the rate of ripening of different varieties, the concentration of sugar in various portions of the stalk at periodic intervals, and the effect of removal of varying proportions of the immature upper portion of the stalks on yields of sugar per ton of cane and per acre are summarized in this circular. It is likely that there would be considerable variation between the results of these studies and results of similar studies carried on in other localities, and even in this locality under seasonal conditions differing from those prevailing during the two seasons. The results, however, especially those concerning effective topping as a means for improving the quality and correspondingly increasing the value of mill cane, should prove of great value both to the cane grower and the mill owner in indicating means for the better utilization of varieties of cane now available for commercial culture. Results of these studies are also of great value in connection with the Department's sugarcane-breeding program, since determination of the comparative early-maturing qualities and other favorable characteristics of varieties of different parentages, especially those of the C. P. varieties which were bred at the United States Sugar Plant Field Station at Canal Point, Fla., permits more dependable selection of parent varieties for future matings.

EXPERIMENTAL METHODS

Sugarcane used for these studies was taken from experimental plots on the field station at Houma, where the different varieties were grown under conditions as nearly comparable as possible, samples having been taken at semimonthly intervals from mid-October to early January. For studies on the effect of topping duplicate samples, consisting of 30 stalks of each variety, were taken at each sampling date throughout the harvesting season in 1932–33, and single 40-stalk samples were taken throughout the harvesting season in 1933–34, experiments carried on previously having shown that such samples are adequately representative. As a precaution against errors resulting from selective sampling, a sufficient number of stalks of each variety were tagged with the date on which all stalks for each periodic sample were to be cut. These stalks were located at random throughout each plot of cane in such a manner as to insure that each periodic sample would be as nearly comparable as possible with all other samples from the same area. On the dates indicated, all stalks so tagged were cut in accordance with the usual practice followed in Louisiana in harvesting cane for milling. Stalks from samples of different varieties were then cut into three segments of equal length and the top segment was subdivided into three parts of equal length. Sets of segments corresponding to the same portion of the stalk were assembled according to sample, weighed, and crushed separately by means of a three-roll, power-driven mill, giving a juice extraction of approximately 60 percent with varieties such as P. O. J. 213. Brix and sucrose (polarization) determinations were made in the usual manner.

From the data so obtained, juice analyses of whole-stalk samples and also of corresponding samples with different portions of the tops removed were determined on the basis of the average juice analysis

of the component parts weighted on the basis of cane weights. Preliminary weights had indicated that there was no measurable difference in the percentage of juice extracted with the laboratory mill from different portions of the same sample cut into segments as above. It was, therefore, assumed that the weight of the juice from each of the component parts of a sample was in direct proportion to the weight of the cane involved and that the weighted average analyses, as above determined, would correspond to the analysis of a composite sample made up of an aliquot part of the juice from each set of the segments involved. While it is possible that the relationship might be subject to minor discrepancies, not measurable by the limited studies conducted, it was felt that the values should be in sufficiently close agreement to answer the purpose of these studies. Thus it is possible to measure the effect of removing different portions of the tops without introducing errors of field sampling.

Whole stalks and juice analyses computed from component parts, as indicated above, were used to determine the rate of ripening of different varieties as measured by changes in available sugar per ton of cane at periodic intervals, and changes in average weight per stalk were taken as an index to changes in indicated yield of cane per acre. In connection with these studies, extensively replicated adjoining plots of all varieties included in maturity tests were harvested for yield comparisons at some date during the course of each test. The observed yield of cane with each variety was taken as the one for the corresponding date in maturity studies. The yield for each variety at every other date was computed on the basis of the relative weight of the cane sample on that date as compared to the weight of one consisting of the same number of stalks of the same variety on the date of harvest of the yield test. While it is realized that this method of arriving at comparative cane yields may not be entirely satisfactory, it is believed that it gives a fairly reliable estimate of changes in yield of cane per acre during the period of the experiment. It is possible that the progressive thinning out of the plots used for maturity studies may have resulted in a somewhat undue growth advantage to the remaining stalks, but it is not believed that this was an important source of error, particularly since comparatively thick stands were maintained until after the period of rapid vegetative growth. From observed juice analyses on the basis of whole stalks and cane-yield data, obtained as described above, it was possible to compute the indicated yield of sugar per acre for each variety at the different dates. From juice analyses of lower portions of the stalk and their relative weights, as compared with the corresponding weights of the whole stalks, yields of sugar per acre for different degrees of topping were likewise computed. The available sugar per ton of cane and per acre in the discarded tops was determined by differences.

Sugar-yield calculations are based on factors given in a previous publication.[2] With P. O. J. 234 as the standard variety, the following factors were used: Juice extraction=76 percent; reduction factors to convert laboratory mill juice analyses to the basis of completed milling, Brix 0.985, sucrose 0.970; boiling-house efficiency, 100 percent; Winter-Carp formula. The indicated yield of sugar per

[2] ARCENEAUX, G., STOKES, I. E., BISLAND, R. B., and KRUMBHAAR, C. C. VARIETY TESTS OF SUGARCANES IN LOUISIANA DURING THE CROP YEAR 1931-32. U. S. Dept. Agr. Circ. 298, 32 pp. 1933.

ton of cane as compared above applied directly with P. O. J. 213, P. O. J. 36–M, P. O. J. 234, and Co. 281. In order to make allowance for differences in milling qualities between these and other varieties, "varietal correction factors" based on results of milling studies previously conducted [3] were applied as follows to sugar yields as computed above: For C. P. 807 and C. P. 28/19, computed yield × 0.98; for Co. 290, computed yield × 1.06.

In table 1 are summarized pertinent weather observations made during periods over which maturity studies extended. Temperatures given were recorded at the weather station on the laboratory grounds at a point approximately 100 yards from the bayou. No attempt was made to record exact temperatures at each of the three test plots, which must have differed somewhat in view of the differences in elevation and distance from the nearby stream. The elevation and distance from the stream of plant-cane plots on light soil correspond very closely to those under which temperature observations were made. Plant-cane tests on heavy soil were situated approximately 500 yards from the stream at an average elevation approximately 2 feet below that of the first-mentioned test. First-stubble tests on light soil were at an intermediate location as to distance from the stream and elevation.

TABLE 1.—*Air temperatures and rainfall at the United States Sugar Plant Field Station, Houma, La., during October, November, and December 1932 and 1933*

Day of month	1932									1933								
	Minimum temperature			Maximum temperature			Rainfall			Minimum temperature			Maximum temperature			Rainfall		
	October	November	December	October	November	December	October	November	December	October	November	December	October	November	December	October	November	December
	° F.	° F.	° F.	° F.	° F.	° F.	In.	In.	In.	° F.	° F.	° F.	° F.	° F.	° F.	In.	In.	In.
1	58	54	32	88	84	70				71	66	53	97	76	76		0.71	
2	67	43	37	90	72	73	1.90			68	64		93	84				
3	67	42	42	87	75	73	.09			65	64	66	87	85	77	0.84		1.50
4	68	62	49	89	72	76	.63			67	60	62	85	84	81			
5	55	63	51	68	69	77				64	57	65	86	84	80			.60
6	38	65	55	69	75	74			0.48	54.	49	53	85	84	80			
7	40	64	59	84	75	77			.48	53	50	34	86	63	80			
8	44	50	51	82	69	74				60	41	34	87	68	77			
9	61	35	52	84	67	74				48	38	32	85	74	76			
10	58	41	54	87	74	76				43	39.5	36	83	72	82			
11	63	45	56	77	62	78		0.10		46	35.5	58	86	85	80			
12	44	30	56	77	59	61				47	42	55	87	81	81			
13	59	27	55	77	61	79				52	50	57	89	75	81			
14	52	31	52	79	69	75			.19	57	34	58	87	74	81			
15	65	56	50	81	73	56	1.90	.08	.19	65	42	62	89	73	80	1.68		
16	64	43	37	84	67	54	.22			64	41	60	78	71	80			
17	60	33	24.5	86	56	41		.93		63	43	52	88	78	87			
18	56	40	27	88	44	42				61	62	55	87	74	82			
19	55	32	33	89	55	55				58	59	40	88	78	69		.76	
20	58	33	41	86	65	59			.42	64	55	42	91	80	72			
21	54	31	54	82	79	71				70	63	36	88	71	75		2.17	
22	45	44	62	77	77	73				66	62	41	88	77	76			
23	49	43	57	85	75	74				62	45	49	88	72	76			
24	58	56	53	85	77	76		1.69	.30	58	41	56	82	72	78			
25	61	46	53	83	66	76	5.35		.47	55	43	61	80	63	83			.48
26	51	47	55	78	68	70			.71	39.5	42	63	77	75	76			
27	43	35	52	73	57	67			.57	42	33	41	80	70	52			
28	43	36	48	73	54	65				55	45	47	80	75	64			
29	48	33	48	77	60	74				61	52	50	77	79	62			
30	47	29	65	83	70	73				64	56	53	80	79	71	.92		
31	62		41	85		50	.64			64		52	80		82	.69		

[3] ARCENEAUX, G., KRUMBHAAR, C. C., and BISLAND, R. B. TESTING CANE TO DETERMINE PROBABLE MILLING YIELD. Facts About Sugar 28: 350–353. 1933.

STUDIES OF RIPENING

Comparative yields of cane and indicated yields of sugar observed with several important varieties in plant-cane and first-stubble tests at semimonthly intervals during the 1932–33 and 1933–34 harvesting periods are given in tables 2 and 3. The data show that in addition to a very rapid increase in indicated yield of sugar per ton of cane during the periods of observation there was a material increase in yield of cane per acre when growth was not interrupted by critically low temperatures. The definitely measurable gains observed during the freeze-free period between October 14 and November 15, 1932, and the enormous average gains made between October 13, 1933, and January 2, 1934, under favorable weather conditions, show conclusively that the loss in cane tonnage incidental to early harvesting under Louisiana conditions is one of major economic importance.

A comparison of results obtained in 1932–33 tests (table 2), when two obviously damaging freezes were reported in the course of the tests (table 1), with those obtained in 1933–34 tests (table 3) under weather conditions approaching ideal, plainly reveals the effects of critical temperatures on growth and maturity of sugarcane under Louisiana conditions. The relationship will be more readily appreciated by referring to figures 1, 2, 3, and 4, in which yield and weather data are shown graphically. Between October 14 and November 15, 1932, five varieties in plant-cane tests on light soil showed an average gain of 2.86 tons of cane per acre and 42.6 pounds of sugar per ton of cane, while the same varieties in first-stubble tests showed an average gain of 1.46 tons of cane per acre and 37.7 pounds of sugar per ton of cane. Corresponding average gains by six varieties in plant-cane tests on heavy soil were somewhat similar to those observed in plant-cane tests on light soil. Due to experimental errors involved, great importance cannot be attached to estimates of gain in yield with individual varieties, but the consistently large gains observed with C. P. 807 may be of some significance. Co. 281 and Co. 290 were consistently among the varieties showing the largest gains in indicated yield of sugar per ton of cane.

TABLE 2.—*Yields of cane and indicated yields of sugar at different dates between Oct. 14, 1932, and Jan. 3, 1933*

YIELD OF CANE PER ACRE (TONS)[1]

Variety [2]	Plant-cane tests on light soil						Plant-cane tests on heavy soil						First-stubble tests on light soil					
	Oct. 14	Nov. 1	Nov. 15	Dec. 1	Dec. 15	Jan. 3 [3]	Oct. 15	Nov. 1	Nov. 15	Dec. 1	Dec. 15	Jan. 3 [3]	Oct. 14	Nov. 1	Nov. 15	Dec. 2	Dec. 15	Jan. 3 [3]
P. O. J. 213	21.53	23.15	24.94	21.63	23.16	22.14	18.59	21.85	23.10	23.12	23.10	16.65	19.72	18.60	19.02	17.71	19.02	11.81
P. O. J. 234	21.89	22.57	24.42	24.74	23.32	24.39	20.26	21.01	22.69	21.94	21.46	12.23	16.16	16.52	17.98	16.36	17.20	11.41
Co. 281	24.89	28.34	28.43	27.20	27.23	24.35	24.14	25.32	28.17	26.42	29.07	21.30	22.31	22.60	22.87	22.48	24.17	15.04
Co. 290	35.19	35.93	36.99	37.22	39.14	0	33.24	37.13	36.05	37.96	40.30	0	30.57	31.08	32.14	31.27	32.24	23.38
C. P. 807	34.32	33.16	37.32	32.81	32.23	34.26	27.70	30.15	33.10	29.96	31.88	23.67	26.74	30.59	30.81	26.80	27.76	21.39
C. P. 28/19	------	------	------	------	------	------	30.46	33.20	31.86	33.99	33.48	28.34	------	------	------	------	------	------
Average	27.56	28.63	30.42	28.72	29.02	21.03	25.73	28.11	29.16	28.90	29.88	17.03	23.10	23.88	24.56	22.92	24.08	16.61

INDICATED YIELD OF 96° SUGAR PER TON OF CANE (POUNDS)

P. O. J. 213	139.4	165.5	187.7	189.5	188.9	162.2	181.8	197.4	206.1	212.3	198.7	189.4	158.2	189.2	191.3	187.6	185.4	151.4
P. O. J. 234	166.5	200.3	206.6	209.1	207.2	177.0	187.6	219.4	224.8	225.9	215.0	184.1	169.3	195.5	212.2	203.0	205.7	185.9
Co. 281	165.1	175.7	209.7	220.5	230.9	221.0	176.8	209.7	219.3	225.3	222.7	220.3	164.9	196.2	206.8	209.7	208.9	208.6
Co. 290	133.4	155.2	174.5	175.1	179.9	0	165.0	186.0	205.0	209.1	205.3	0	160.4	191.7	199.6	206.5	208.9	198.5
C. P. 807	118.2	146.5	156.8	164.5	173.5	151.0	164.9	179.4	187.1	192.4	192.9	173.5	164.4	191.9	196.5	190.8	181.3	183.5
C. P. 28/19	------	------	------	------	------	------	176.0	202.9	214.3	222.3	230.3	218.4	------	------	------	------	------	------
Average [4]	141.5	166.6	184.1	189.3	193.8	175.6	174.0	197.4	208.3	213.8	210.9	199.6	163.1	192.7	200.8	200.0	198.3	188.0

INDICATED YIELD OF 96° SUGAR PER ACRE (POUNDS)

P. O. J. 213	3,001	3,831	4,681	4,099	4,375	3,591	3,380	4,313	4,761	4,908	4,590	3,154	3,120	3,519	3,639	3,322	3,526	1,788
P. O. J. 234	3,645	4,521	5,045	5,173	4,832	4,317	3,801	4,610	5,101	4,956	4,614	2,252	2,736	3,230	3,815	3,321	3,538	2,121
Co. 281	4,109	4,979	5,962	5,998	6,287	5,384	4,268	5,310	6,178	5,952	6,474	4,692	3,679	4,434	4,730	4,714	5,049	3,137
Co. 290	4,694	5,576	6,455	6,517	7,041	0	5,485	6,906	7,390	7,937	8,274	0	4,903	5,958	6,415	6,457	6,735	4,641
C. P. 807	4,057	4,858	5,852	5,397	5,592	5,173	4,568	5,409	6,193	5,764	6,150	4,107	4,396	5,870	6,054	5,113	5,033	3,925
C. P. 28/19	------	------	------	------	------	------	5,361	6,736	6,828	7,556	7,710	6,189	------	------	------	------	------	------
Average	3,901	4,753	5,599	5,437	5,625	3,693	4,477	5,548	6,075	6,179	6,302	3,399	3,767	4,602	4,931	4,585	4,776	3,122

[1] Tons of 2,000 pounds are used in tests reported in this circular.

[2] Many varieties of sugarcane are commonly designated by letters or other abbreviations indicating the origin of the seedling cane. The meanings of such designations for the varieties mentioned throughout this circular are as follows: Co.=Coimbatore (India) seedlings; C. P.=Canal Point (Fla.) seedlings; P. O. J.=Proefstation Oost Java seedlings; 36-M=Mingka selection of P. O. J. 36; U. S.=U. S. Dept. Agr. best selections from Canal Point seedlings.

[3] Topped so as to eliminate portions of the stalk, the juice from which could not be satisfactorily clarified for polarization.

[4] Weighted average.

TABLE 3.—*Yields of cane and indicated yields of sugar at different dates between Oct. 13, 1933, and Jan. 2, 1934*

YIELD OF CANE PER ACRE (TONS)

Variety	Plant-cane tests on light soil						First-stubble tests on light soil					
	Oct. 13	Oct. 31	Nov. 14	Dec. 1	Dec. 18	Jan. 2	Oct. 13	Oct. 31	Nov. 14	Dec. 1	Dec. 18	Jan. 2
P. O. J. 213	18.87	19.04	21.21	21.60	23.41	24.26	26.87	25.98	23.50	26.80	28.40	26.84
P. O. J. 234	17.83	20.63	22.01	21.13	22.23	24.49	19.76	22.41	22.20	23.14	22.51	24.83
Co. 281	18.56	21.03	21.77	24.67	24.87	26.02	23.88	25.72	26.10	22.96	27.18	29.43
Co. 290	30.90	32.26	39.08	32.28	39.20	38.87	36.55	38.06	38.90	39.34	39.85	44.18
C. P. 807	23.06	26.12	28.04	29.03	32.13	29.73	33.69	31.96	35.40	34.00	37.26	35.84
C. P. 28/19	21.13	25.47	30.15	29.91	30.49	29.75	24.07	26.35	29.92	27.98	35.07	31.52
Average	21.72	24.09	27.04	26.44	28.72	28.85	27.47	28.41	29.34	29.04	31.71	32.11

INDICATED YIELD OF 96° SUGAR PER TON OF CANE (POUNDS)

P. O. J. 213	120.0	140.2	160.4	175.1	194.6	193.0	113.8	156.0	156.7	182.6	205.5	187.3
P. O. J. 234	147.0	171.9	178.4	186.8	200.8	206.3	114.0	140.8	167.4	175.8	190.1	204.0
Co. 281	103.5	141.4	146.8	185.0	201.7	211.1	120.1	137.6	157.6	188.7	196.7	213.9
Co. 290	136.6	152.4	156.5	189.0	201.0	205.7	144.6	168.1	178.1	208.1	215.9	235.1
C. P. 807	124.3	154.5	152.1	177.7	183.5	204.5	116.2	136.2	161.3	168.0	164.2	178.4
C. P. 28/19	144.1	187.4	198.2	208.4	221.0	229.6	159.2	183.1	204.4	208.4	217.1	238.2
Average [1]	130.0	158.5	165.7	187.7	200.5	208.7	128.7	154.4	171.9	189.5	198.6	211.1

INDICATED YIELD OF 96° SUGAR PER ACRE (POUNDS)

P. O. J. 213	2,264	2,669	3,402	3,782	4,556	4,682	3,058	4,053	3,682	4,894	5,836	5,027
P. O. J. 234	2,621	3,546	3,927	3,947	4,464	5,052	2,253	3,155	3,716	4,068	4,279	5,065
Co. 281	1,921	2,974	3,196	4,564	5,016	5,493	2,868	3,539	4,113	4,333	5,346	6,295
Co. 290	4,221	4,916	6,116	6,101	7,879	7,996	5,285	6,398	6,928	8,187	8,604	10,387
C. P. 807	2,866	4,036	4,265	5,159	5,896	6,080	3,915	4,353	5,710	5,712	6,118	6,394
C. P. 28/19	3,045	4,773	5,976	6,233	6,738	6,831	3,832	4,825	6,116	5,831	7,614	7,508
Average	2,823	3,819	4,480	4,964	5,758	6,022	3,535	4,387	5,044	5,504	6,299	6,779

[1] Weighted average.

The effects of the low temperature of 27° F. on November 13, 1932, were reflected in a very definite change in the progress of growth and maturity with all varieties, although the observed results indicate rather important differences between varieties with regard to their response to the conditions encountered. Following the freeze, examination of stalks from plant-cane plots on heavy soil and first-stubble plots on light soil revealed considerable terminal bud injury, but lateral buds were in most cases unaffected. Similar but generally less severe injury was observed in plant-cane tests on light soil. While plots of different varieties in the same tests were in close proximity, considerable differences as to exposure probably resulted from existing differences in mode of growth between varieties. In general, erect varieties, such as Co. 290, suffered less apparent damage than those making more recumbent growth, which seems to indicate that the former may possibly have escaped critical temperatures by reason of having the vulnerable growing tips at relatively higher elevations. From a consideration of yield data, it is apparent that Co. 290 showed probably less evidence of injury from the 27° freeze than did any of the other varieties, although its rates of growth and maturity were unquestionably influenced. Co. 281 and C. P. 28/19 were also among the less severely affected. As will be noted, the

yields of cane observed on December 15 (excepting only Co. 290) were consistently lower than corresponding ones observed on November 15. Partial desiccations of portions of the stem following severe freeze injury may probably account, in part at least, for this observed drop in yield.

Freezing temperatures on December 17, 1932, when a minimum of 24.5° F. was recorded at the laboratory weather station, caused severe damage to cane of all varieties. Lateral buds were killed nearly to

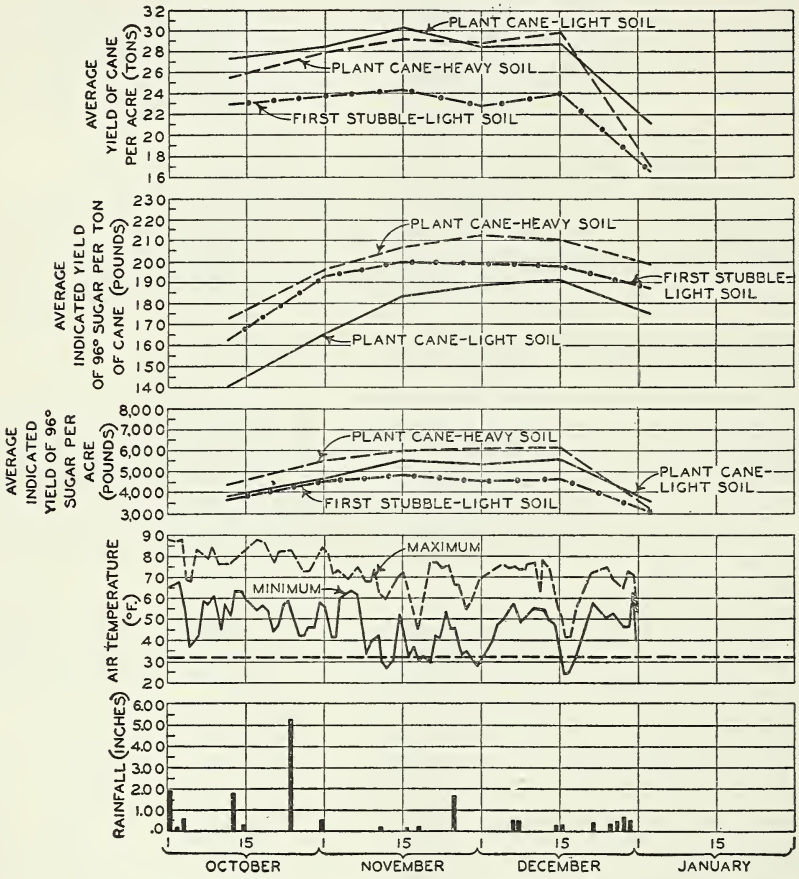
AVERAGE YIELD OF CANE PER ACRE (TONS)
PLANT CANE-LIGHT SOIL
PLANT CANE-HEAVY SOIL
FIRST STUBBLE-LIGHT SOIL
AVERAGE INDICATED YIELD OF 96° SUGAR PER TON OF CANE (POUNDS)
PLANT CANE-HEAVY SOIL
FIRST STUBBLE-LIGHT SOIL
PLANT CANE-LIGHT SOIL
AVERAGE INDICATED YIELD OF 96° SUGAR PER ACRE (POUNDS)
PLANT CANE-HEAVY SOIL
PLANT CANE-LIGHT SOIL
FIRST STUBBLE-LIGHT SOIL
AIR TEMPERATURE (°F.)
MAXIMUM
MINIMUM
RAINFALL (INCHES)
1 15 1 15 1 15 1 15
OCTOBER NOVEMBER DECEMBER JANUARY

FIGURE 1.—Graphical summary of maturity tests during 1932–33 (average of all varieties) and pertinent weather data (tables 1 and 2).

the ground surface, and all varieties showed severe stem injury. Judging from juice analyses made on January 3, 1933, Co. 290 showed the most severe deterioration in plant-cane tests. In no case could any portion of the stalk be satisfactorily clarified for polarization. In first-stubble tests, where this variety had reached a higher stage of maturity at the time of the freeze, an indicated yield of 198.5 pounds of sugar per ton of cane was obtained on January 3 by discarding the top two-ninths (approximately 20 percent by weight) of the stalk. The extent of injury suffered by other varieties is indi-

cated by the "topping" required, January 3, to obtain juice which could be clarified for analysis, and also by the drops in indicated yield of sugar per ton of cane and per acre (table 2). It is interesting to note that on that date juice from whole stalks of P. O. J. 213, P. O. J. 234, and C. P. 807 in plant-cane tests on light soil was apparently of satisfactory commercial value, although there had occurred sharp drops in indicated yields of sugar per ton of cane. In other tests with these varieties, juice from upper portions of the stalk, ranging from approximately 10 to approximately 30 percent of the

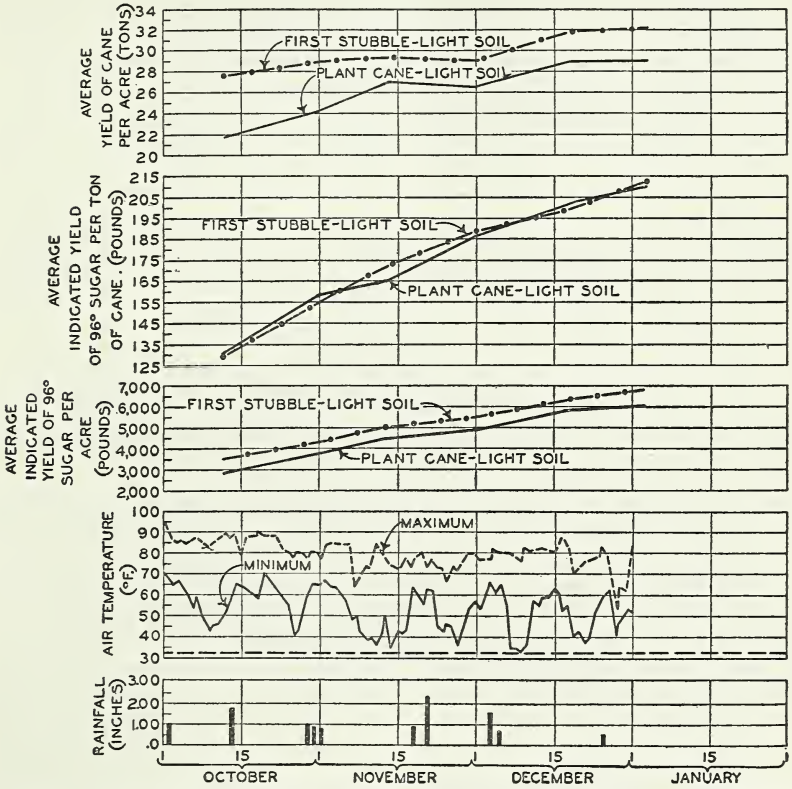

FIGURE 2.—Graphical summary of results of maturity tests during 1933–34 (average of all varieties) and pertinent weather data (tables 1 and 3).

whole by weight, was perceptibly sour and could not be clarified for polarization. In tests on heavy soil, C. P. 28/19 suffered relatively less damage than was observed with other varieties from the December 17 freeze. From a consideration of results of all tests, Co. 281 apparently suffered less severe damage from this freeze than did Co. 290.

In the absence of damaging freezes during the 1933–34 harvest period (table 3) all varieties tested made large gains in yield of cane per acre and indicated yield of sugar per ton of cane. Between October 13, 1933, and January 2, 1934, six varieties in plant-cane tests showed an average gain of 7.13 tons of cane per acre and an

indicated average gain of 78.7 pounds of sugar per ton of cane. The same varieties in first-stubble tests made an average gain of 4.64

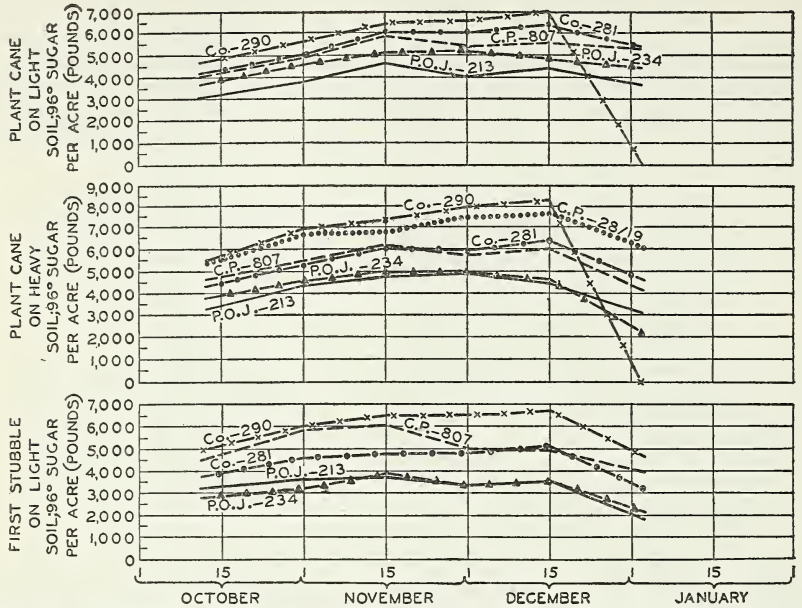

FIGURE 3.—Indicated yields of sugar per acre of several varieties of sugarcane at different dates during the 1932–33 harvest period (table 2).

tons of cane per acre and 82.4 pounds of sugar per ton of cane. Co. 281 showed consistently large gains in both tests. Within the above-

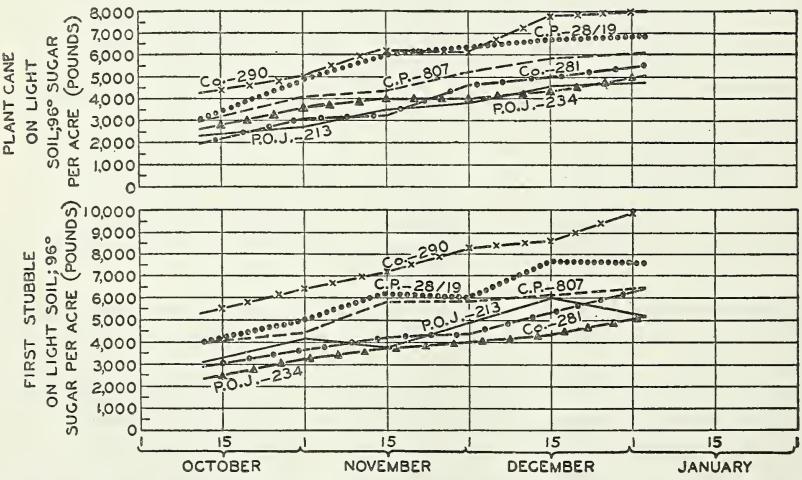

FIGURE 4.—Indicated yields of sugar per acre of several varieties of sugarcane at different dates during the 1933–34 harvest period (table 3).

mentioned period its indicated yield of sugar per ton of cane increased from 103.5 to 211.1 pounds in plant-cane tests and from 120.1 to 213.9 pounds in first-stubble tests, while its indicated yield of sugar

per acre increased from 1,921 to 5,493 pounds in plant-cane tests and from 2,868 to 6,295 pounds in first-stubble tests.

In the absence of any apparent freeze damage during the period covered by 1933–34 studies, the results reported in table 3 cannot be regarded as representative. The minimum temperature of 32° F. recorded on December 9 had apparently no harmful effects on growth and maturity. During the period between November 14 and December 1, the cane made apparently little vegetative growth, as measured by the average increase of yield of cane per acre, but made approximately normal progress in maturity, as measured by indicated yield of sugar per ton of cane. The observed growth deficiency was probably due to the comparatively low average temperature recorded.

According to the Weather Bureau observations, the probability of temperatures of 27° F., or lower, at Houma during November is 12 out of 100.[4] While it is recognized that the harmful effects of a given critical temperature will probably depend on many factors, among which might be mentioned the duration, vertical temperature gradient, humidity, etc., it would seem from a consideration of observed effects of the 27° freeze during 1932, that sugarcane of varieties tested can probably be expected to make fairly normal progress in growth and maturity until December 1 at Houma and localities of similar exposure.

STUDIES OF EFFECT OF TOPPING

It is well known that the analysis of the juice from mill cane grown under Louisiana conditions can be regulated within certain limits by discarding varying proportions of comparatively immature tops when the cane is harvested. The extent to which it is economically desirable to increase the sugar content of mill cane by discarding increasing proportions of the tops differs under different conditions, among which are the market value of sugar and molasses, the cost of transporting the cane, and the conditions under which it may be purchased from the grower. In the case of factory owners producing cane on areas adjacent to factories, the main consideration is whether or not the value of the sugar and molasses lost per acre as a result of discarding immature top portions of the stalk is greater than the resulting saving in transportation and manufacturing costs. An additional consideration, which depends largely on factory capacity and total tonnage of cane available, involves the question of the extent to which it may be advantageous to reduce the tonnage of mill cane by discarding the more immature portion in the interest of expediting grinding of the crop within the limited grinding period.

Under the sliding-scale contracts usually employed in Louisiana for the purchase of cane, in which the purchase price decreases rapidly as the percentage of sucrose decreases below the basic percentage established in the contract as the standard, proper topping is of even greater importance to the grower who sells cane because it is frequently possible, by discarding certain portions of the upper part of the stalk of below-standard cane, to so enhance the value of delivered mill cane as to result in a very definite gain in returns for his crop.

[4] United States Department of Agriculture, Weather Bureau. southern louisiana. U. S. Dept. Agr., Weather Bur. Bull. W, ed. 3, Climatic Summary of the United States, sec. 62, 25 pp., illus. 1933.

Results of experimental studies of the effect of topping carried on throughout the harvesting periods in 1932–33 and 1933–34 are given in tables 4, 5, 6, 7, and 8, in which are included analyses of juice from representative whole-stalk samples of plant and first-stubble cane taken at progressive dates, corresponding analyses of juice from the remainder of the samples after removal of different portions of the upper part of the stalks, and other pertinent data. Methods of sampling are described in the preceding section on Experimental Methods. Analyses shown are on a basis of laboratory-mill extraction and correspond to a level of juice extraction somewhat higher than that usually obtained with factory-mill crushers. Factors for converting percentage of sucrose on this basis to percentage of sucrose in juice from complete milling (normal juice) approximate 0.98 for Co. 290 and 0.97 for other varieties.

Yields of cane per acre from different varieties at dates corresponding to those on which the analyses were made are also included in the tables. These yields were determined in accordance with the procedure described under Experimental Methods.

TABLE 4.—*Effect of topping sugarcane of different varieties on juice analyses and indicated yields of sugar from plant cane on light soil, United States Sugar Plant Field Station, Houma, La., 1932–33*

Variety and date	Extent of topping (by length)	Mill cane					Discarded tops	
		Laboratory-mill juice analyses		Cane per acre	Indicated available 96° sugar		Cane per acre	Indicated available 96° sugar per ton of cane
		Brix	Sucrose		Per ton of cane	Per acre		
			Percent	*Tons*	*Pounds*	*Pounds*	*Tons*	*Pounds*
Oct. 14, 1932:								
P. O. J. 213	None	13.95	10.53	21.53	139.4	3,001		
	One-ninth	14.32	11.08	19.32	148.9	2,877	2.21	56.1
	Two-ninths	14.55	11.47	17.08	155.9	2,663	4.45	76.0
	One-third	14.74	11.79	14.80	161.5	2,390	6.73	90.8
P. O. J. 234	None	15.53	12.25	21.89	166.5	3,645		
	One-ninth	15.91	12.82	19.76	176.4	3,486	2.13	74.6
	Two-ninths	16.23	13.33	17.56	185.4	3,256	4.33	89.8
	One-third	16.51	13.76	15.28	192.9	2,948	6.61	105.4
Co. 281	None	15.55	12.19	24.89	165.1	4,109		
	One-ninth	16.06	12.90	22.59	177.2	4,003	2.30	46.1
	Two-ninths	16.47	13.50	20.07	187.5	3,763	4.82	71.8
	One-third	16.84	14.08	17.48	197.7	3,456	7.41	88.1
Co. 290	None	13.68	9.82	35.19	133.4	4,694		
	One-ninth	14.15	10.42	31.89	143.9	4,589	3.30	31.8
	Two-ninths	14.53	10.98	28.40	154.2	4,379	6.79	46.4
	One-third	14.87	11.47	24.73	163.1	4,033	10.46	63.2
C. P. 807	None	12.75	9.31	34.32	118.2	4,057		
	One-ninth	13.05	9.80	31.21	126.7	3,954	3.11	33.1
	Two-ninths	13.31	10.19	27.81	133.4	3,710	6.51	53.3
	One-third	13.52	10.52	24.36	139.0	3,386	9.96	67.4
Nov. 1, 1932:								
P. O. J. 213	None	15.04	12.06	23.15	165.5	3,831		
	One-ninth	15.35	12.58	20.60	174.7	3,599	2.55	91.0
	Two-ninths	15.54	12.84	18.24	179.1	3,267	4.91	114.9
	One-third	15.76	13.17	15.89	184.9	2,938	7.26	123.0
P. O. J. 234	None	15.76	13.89	22.57	200.3	4,521		
	One-ninth	16.05	14.44	20.47	210.4	4,307	2.10	101.9
	Two-ninths	16.15	14.77	18.42	216.8	3,993	4.15	127.2
	One-third	16.16	15.01	16.21	221.9	3,597	6.36	145.3
Co. 281	None	16.96	13.09	28.34	175.7	4,979		
	One-ninth	17.49	13.72	25.79	185.9	4,794	2.55	72.5
	Two-ninths	17.85	14.14	23.04	192.7	4,440	5.30	101.7
	One-third	18.09	14.30	20.04	194.6	3,900	8.30	130.0
Co. 290	None	14.75	11.09	35.93	155.2	5,576		
	One-ninth	15.23	11.69	32.52	165.7	5,389	3.41	54.8
	Two-ninths	15.55	12.14	29.14	173.9	5,067	6.79	75.0
	One-third	15.83	12.56	25.37	181.6	4,607	10.56	91.8

TABLE 4.—*Effect of topping sugarcane of different varieties on juice analyses and indicated yields of sugar from plant cane on light soil, United States Sugar Plant Field Station, Houma, La., 1932–33*—Continued

Variety and date	Extent of topping (by length)	Mill cane					Discarded tops	
		Laboratory-mill juice analyses		Cane per acre	Indicated available 96° sugar		Cane per acre	Indicated available 96° sugar per ton of cane
		Brix	Sucrose		Per ton of cane	Per acre		
			Percent	*Tons*	*Pounds*	*Pounds*	*Tons*	*Pounds*
Nov. 1, 1932—Con.								
C. P. 807	None	13.99	11.01	33.16	146.5	4,858		
	One-ninth	14.36	11.51	29.84	154.7	4,616	3.32	72.9
	Two-ninths	14.58	11.84	26.66	160.3	4,274	6.50	89.8
	One-third	14.78	12.11	23.31	164.8	3,841	9.85	103.2
Nov. 15, 1932:								
P. O. J. 213	None	15.76	13.30	24.94	187.7	4,681		
	One-ninth	16.09	13.81	22.25	196.6	4,374	2.69	114.1
	Two-ninths	16.22	14.05	19.70	200.9	3,958	5.24	138.0
	One-third	16.30	14.15	17.11	202.6	3,466	7.83	155.2
P. O. J. 234	None	16.76	14.47	24.42	206.6	5,045		
	One-ninth	17.19	15.15	21.95	218.5	4,796	2.47	100.8
	Two-ninths	17.39	15.51	19.61	225.0	4,412	4.81	131.6
	One-third	17.56	15.78	17.14	229.8	3,939	7.28	152.0
Co. 281	None	17.01	14.69	28.43	209.7	5,962		
	One-ninth	17.48	15.39	25.50	221.9	5,658	2.93	103.8
	Two-ninths	17.89	15.86	22.74	229.4	5,217	5.69	130.9
	One-third	18.05	16.24	19.84	236.6	4,694	8.59	147.6
Co. 290	None	15.28	12.09	36.99	174.5	6,455		
	One-ninth	15.88	12.80	33.36	186.7	6,228	3.63	62.5
	Two-ninths	16.21	13.32	29.59	196.4	5,811	7.40	87.0
	One-third	16.47	13.76	25.74	204.7	5,269	11.25	105.4
C. P. 807	None	14.26	11.58	37.32	156.8	5,852		
	One-ninth	14.59	12.11	33.77	166.0	5,606	3.55	69.3
	Two-ninths	14.76	12.40	29.86	171.0	5,106	7.46	100.0
	One-third	14.97	12.73	26.09	176.7	4,610	11.23	110.6
Dec. 1, 1932:								
P. O. J. 213	None	15.70	13.37	21.63	189.5	4,099		
	One-ninth	16.00	13.86	19.16	198.2	3,798	2.47	121.9
	Two-ninths	16.12	14.07	16.89	202.0	3,412	4.74	144.9
	One-third	16.16	14.20	14.62	204.5	2,990	7.01	158.2
P. O. J. 234	None	17.05	14.67	24.74	209.1	5,173		
	One-ninth	17.39	15.22	22.27	218.8	4,873	2.47	121.5
	Two-ninths	17.55	15.50	19.97	223.8	4,469	4.77	147.6
	One-third	17.66	15.69	17.57	227.2	3,992	7.17	164.7
Co. 281	None	17.60	15.36	27.20	220.5	5,998		
	One-ninth	18.05	16.06	24.59	232.7	5,722	2.61	105.7
	Two-ninths	18.31	16.52	21.98	241.0	5,297	5.22	134.3
	One-third	18.50	16.85	19.26	246.9	4,755	7.94	156.5
Co. 290	None	15.67	12.23	37.22	175.1	6,517		
	One-ninth	16.10	12.91	33.50	187.8	6,291	3.72	60.8
	Two-ninths	16.36	13.36	29.92	196.3	5,873	7.30	88.2
	One-third	16.59	13.79	26.20	204.6	5,361	11.02	104.9
C. P. 807	None	14.73	12.08	32.81	164.5	5,397		
	One-ninth	14.98	12.50	29.59	171.8	5,084	3.22	97.2
	Two-ninths	15.14	12.79	26.41	177.0	4,675	6.40	112.8
	One-third	15.26	12.98	23.10	180.2	4,163	9.71	127.1
Dec. 15, 1932:								
P. O. J. 213	None	15.60	13.31	23.16	188.9	4,375		
	One-ninth	15.80	13.67	20.75	195.4	4,055	2.41	132.8
	Two-ninths	15.86	13.82	18.30	198.2	3,627	4.86	153.9
	One-third	15.90	13.91	15.84	199.9	3,166	7.32	165.2
P. O. J. 234	None	16.76	14.50	23.32	207.2	4,832		
	One-ninth	17.01	14.95	21.22	215.3	4,569	2.10	125.2
	Two-ninths	17.18	15.23	19.10	220.3	4,208	4.22	147.9
	One-third	17.30	15.45	16.86	224.3	3,782	6.46	162.5
Co. 281	None	17.96	15.95	27.23	230.9	6,287		
	One-ninth	18.28	16.50	24.72	240.7	5,950	2.51	134.3
	Two-ninths	18.49	16.88	22.06	247.6	5,462	5.17	159.6
	One-third	18.64	17.13	19.33	252.0	4,871	7.90	179.2
Co. 290	None	15.81	12.48	39.14	179.9	7,041		
	One-ninth	16.18	13.08	35.42	191.1	6,769	3.72	73.1
	Two-ninths	16.45	13.54	31.66	199.8	6,326	7.48	95.6
	One-third	16.69	13.94	27.75	207.4	5,755	11.39	112.9
C. P. 807	None	15.32	12.68	32.23	173.5	5,592		
	One-ninth	15.48	13.05	29.14	180.3	5,254	3.09	109.4
	Two-ninths	15.60	13.32	26.01	185.3	4,820	6.22	124.1
	One-third	15.68	13.54	22.63	189.4	4,286	9.60	136.0

TABLE 4.—*Effect of topping sugarcane of different varieties on juice analyses and indicated yields of sugar from plant cane on light soil, United States Sugar Plant Field Station, Houma, La., 1932–33*—Continued

Variety and date	Extent of topping (by length)	Mill cane					Discarded tops	
		Laboratory-mill juice analyses		Cane per acre	Indicated available 96° sugar		Cane per acre	Indicated available 96° sugar per ton of cane
		Brix	Sucrose		Per ton of cane	Per acre		
Jan. 3, 1933:			*Percent*	*Tons*	*Pounds*	*Pounds*	*Tons*	*Pounds*
P. O. J. 213	None	14.40	11.72	22.14	162.2	3,591		
	One-ninth	14.57	11.99	19.84	166.9	3,311	2.30	121.7
	Two-ninths	14.64	12.14	17.53	169.7	2,975	4.61	133.6
	One-third	14.66	12.23	15.08	171.5	2,586	7.06	142.4
P. O. J. 234	None	15.29	12.67	24.39	177.0	4,317		
	One-ninth	15.57	13.16	22.05	185.8	4,097	2.34	94.0
	Two-ninths	15.72	13.47	19.66	191.6	3,767	4.73	116.3
	One-third	15.75	13.68	17.19	195.9	3,368	7.20	131.8
Co. 281	None	16.61		26.85				
	One-ninth	16.94	15.20	24.35	221.1	5,384	2.50	
	Two-ninths	17.19	15.63	21.72	228.8	4,970	5.13	
	One-third	17.33	15.91	18.96	234.0	4,437	7.89	
Co. 290	None	14.34		36.95				
	One-ninth	14.70		34.07			2.88	
	Two-ninths	15.03		30.41			6.54	
	One-third	15.30		26.46			10.49	
C. P. 807	None	14.00	11.23	34.26	151.0	5,173		
	One-ninth	14.44	11.61	31.01	156.4	4,850	3.25	99.4
	Two-ninths	14.46	11.91	27.61	162.6	4,489	6.65	102.9
	One-third	14.61	12.15	24.02	166.7	4,004	10.24	114.2

TABLE 5.—*Effect of topping sugarcane of different varieties on juice analyses and indicated yields of sugar from plant cane on heavy soil, United States Sugar Plant Field Station, Houma, La., 1932–33*

Variety and date	Extent of topping (by length)	Mill cane					Discarded tops	
		Laboratory-mill juice analyses		Cane per acre	Indicated available 96° sugar		Cane per acre	Indicated available 96° sugar per ton of cane
		Brix	Sucrose		Per ton of cane	Per acre		
Oct. 14, 1932:			*Percent*	*Tons*	*Pounds*	*Pounds*	*Tons*	*Pounds*
P. O. J. 213	None	15.84	13.05	18.59	181.8	3,380		
	One-ninth	16.18	13.56	16.94	190.6	3,229	1.65	91.5
	Two-ninths	16.46	13.99	15.15	198.1	3,001	3.44	110.2
	One-third	16.66	14.28	13.27	203.1	2,695	5.32	128.8
P. O. J. 234	None	15.91	13.34	20.26	187.6	3,801		
	One-ninth	16.35	13.98	18.27	198.6	3,628	1.99	86.9
	Two-ninths	16.59	14.43	16.33	206.8	3,377	3.93	107.9
	One-third	16.73	14.74	14.28	212.6	3,036	5.98	127.9
Co. 281	None	16.02	12.87	24.14	176.8	4,268		
	One-ninth	16.52	13.58	21.80	188.9	4,118	2.34	64.1
	Two-ninths	16.91	14.16	19.41	199.0	3,863	4.73	85.6
	One-third	17.26	14.56	16.87	205.4	3,465	7.27	110.5
Co. 290	None	14.89	11.56	33.24	165.0	5,485		
	One-ninth	15.47	12.29	30.02	177.8	5,338	3.22	45.7
	Two-ninths	15.91	12.89	26.72	188.6	5,039	6.52	68.4
	One-third	16.26	13.37	23.20	197.2	4,575	10.04	90.6
C. P. 807	None	15.05	12.19	27.70	164.9	4,568		
	One-ninth	15.37	12.68	25.12	173.2	4,351	2.58	84.1
	Two-ninths	15.59	13.07	22.27	180.1	4,011	5.43	102.6
	One-third	15.76	13.36	19.33	185.2	3,580	8.37	118.0
C. P. 28/19	None	16.46	13.13	30.46	176.0	5,361		
	One-ninth	16.95	13.84	27.47	188.0	5,164	2.99	65.9
	Two-ninths	17.47	14.47	24.43	198.1	4,840	6.03	86.4
	One-third	17.84	15.02	21.23	207.4	4,403	9.23	103.8

TABLE 5.—*Effect of topping sugarcane of different varieties on juice analyses and indicated yields of sugar from plant cane on heavy soil, United States Sugar Plant Field Station, Houma, La., 1932–33*—Continued

Variety and date	Extent of topping (by length)	Mill cane					Discarded tops	
		Laboratory-mill juice analyses		Cane per acre	Indicated available 96° sugar		Cane per acre	Indicated available 96° sugar per ton of cane
		Brix	Sucrose		Per ton of cane	Per acre		
			Percent	*Tons*	*Pounds*	*Pounds*	*Tons*	*Pounds*
Nov. 1, 1932:								
P. O. J. 213	None	16.50	13.97	21.85	197.4	4,313		
	One-ninth	16.85	14.66	19.69	210.1	4,137	2.16	81.5
	Two-ninths	17.08	15.00	17.68	216.0	3,819	4.17	118.5
	One-third	17.25	15.28	15.54	220.9	3,433	6.31	139.5
P. O. J. 234	None	17.63	15.32	21.01	219.4	4,610		
	One-ninth	18.05	15.97	18.91	230.8	4,364	2.10	117.1
	Two-ninths	18.31	16.40	16.87	238.4	4,022	4.14	142.0
	One-third	18.48	16.70	14.71	243.8	3,586	6.30	162.5
Co. 281	None	17.29	14.77	25.32	209.7	5,310		
	One-ninth	17.85	15.58	22.89	223.6	5,118	2.43	79.0
	Two-ninths	18.14	16.04	20.79	231.7	4,817	4.53	108.8
	One-third	18.34	16.40	18.56	238.2	4,421	6.76	131.5
Co. 290	None	16.09	12.83	37.13	186.0	6,906		
	One-ninth	16.66	13.54	33.49	198.4	6,644	3.64	72.0
	Two-ninths	17.01	14.01	30.00	206.8	6,204	7.13	98.5
	One-third	17.30	14.39	26.25	213.6	5,607	10.88	119.4
C. P. 807	None	15.70	13.07	30.15	179.4	5,409		
	One-ninth	16.14	13.71	27.35	190.2	5,202	2.80	73.9
	Two-ninths	16.38	14.12	24.36	197.4	4,809	5.79	103.6
	One-third	16.59	14.47	21.29	203.5	4,333	8.86	121.4
C. P. 28/19	None	17.96	14.84	33.20	202.9	6,736		
	One-ninth	18.26	15.62	29.98	217.5	6,521	3.22	66.8
	Two-ninths	18.63	16.23	26.76	228.1	6,104	6.44	98.1
	One-third	18.93	16.74	23.47	237.0	5,562	9.73	120.7
Nov. 15, 1932:								
P. O. J. 213	None	16.39	14.34	23.10	206.1	4,761		
	One-ninth	16.74	14.89	20.84	215.7	4,495	2.26	117.7
	Two-ninths	16.92	15.19	18.66	221.1	4,126	4.44	143.0
	One-third	17.06	15.42	16.47	225.1	3,707	6.63	159.0
P. O. J. 234	None	17.63	15.57	22.69	224.8	5,101		
	One-ninth	18.05	16.23	20.44	236.4	4,832	2.25	119.6
	Two-ninths	18.25	16.61	18.33	243.3	4,460	4.36	147.0
	One-third	18.35	16.83	15.93	247.4	3,941	6.76	171.6
Co. 281	None	17.45	15.26	28.17	219.3	6,178		
	One-ninth	17.97	16.03	25.38	232.6	5,903	2.79	98.6
	Two-ninths	18.25	16.50	22.70	240.9	5,468	5.47	129.8
	One-third	18.42	16.80	20.06	246.3	4,941	8.11	152.5
Co. 290	None	16.67	13.83	36.05	205.0	7,390		
	One-ninth	17.23	14.61	32.55	219.0	7,128	3.50	74.9
	Two-ninths	17.55	15.14	29.24	229.0	6,696	6.81	101.9
	One third	17.81	15.58	25.60	237.3	6,075	10.45	125.8
C. P. 807	None	15.76	13.45	33.10	187.1	6,193		
	One-ninth	16.15	14.06	29.99	197.5	5,923	3.11	86.8
	Two-ninths	16.38	14.47	26.78	204.8	5,485	6.32	112.0
	One-third	16.58	14.79	23.40	210.3	4,921	9.70	131.1
C. P. 28/19	None	18.00	15.39	31.86	214.3	6,828		
	One-ninth	18.49	16.14	29.31	227.1	6,656	2.55	67.4
	Two-ninths	18.86	16.73	25.81	237.2	6,122	6.05	116.7
	One-third	19.15	17.21	22.62	245.6	5,555	9.24	137.8
Dec. 1, 1932:								
P. O. J. 213	None	16.57	14.68	23.12	212.3	4,908		
	One-ninth	16.84	15.16	21.02	220.9	4,643	2.10	126.2
	Two-ninths	17.03	15.48	18.80	226.6	4,260	4.32	150.0
	One-third	17.15	15.70	16.32	230.6	3,763	6.80	168.4
P. O. J. 234	None	17.49	15.58	21.94	225.9	4,956		
	One-ninth	17.79	16.12	19.92	235.6	4,693	2.02	130.2
	Two-ninths	17.95	16.45	17.86	241.7	4,317	4.08	156.6
	One-third	18.03	16.64	15.71	245.3	3,854	6.23	176.9
Co. 281	None	17.79	15.64	26.42	225.3	5,952		
	One-ninth	18.17	16.24	24.04	235.8	5,669	2.38	118.9
	Two-ninths	18.41	16.68	21.56	243.8	5,256	4.86	143.2
	One-third	18.55	16.97	18.94	249.2	4,720	7.48	164.7
Co. 290	None	16.77	14.04	37.96	209.1	7,937		
	One-ninth	17.20	14.72	34.39	221.8	7,628	3.57	86.6
	Two-ninths	17.47	15.20	30.75	230.9	7,100	7.21	116.1
	One-third	17.67	15.61	26.84	238.9	6,412	11.12	137.1

TABLE 5.—*Effect of topping sugarcane of different varieties on juice analyses and indicated yields of sugar from plant cane on heavy soil, United States Sugar Plant Field Station, Houma, La., 1932–33*—Continued

Variety and date	Extent of topping (by length)	Mill cane					Discarded tops	
		Laboratory-mill juice analyses		Cane per acre	Indicated available 96° sugar		Cane per acre	Indicated available 96° sugar per ton of cane
		Brix	Sucrose		Per ton of cane	Per acre		
		Percent		*Tons*	*Pounds*	*Pounds*	*Tons*	*Pounds*
Dec. 1, 1932—Con.								
C. P. 807	None	16.03	13.78	29.96	192.4	5,764		
	One-ninth	16.33	14.29	27.17	201.3	5,469	2.79	105.7
	Two-ninths	16.52	14.64	24.30	207.5	5,042	5.66	127.6
	One-third	16.67	14.94	21.18	212.9	4,509	8.78	142.9
C. P. 28/19	None	18.41	15.89	33.99	222.3	7,556		
	One-ninth	18.75	16.48	30.90	232.6	7,187	3.09	119.4
	Two-ninths	19.01	16.95	27.60	240.9	6,649	6.39	141.9
	One-third	19.23	17.33	24.03	247.6	5,950	9.96	161.2
Dec. 15, 1932:								
P. O. J. 213	None	15.64	13.78	23.10	198.7	4,590		
	One-ninth	15.84	14.11	21.04	204.6	4,305	2.06	138.3
	Two-ninths	16.00	14.38	18.97	209.4	3,972	4.13	149.6
	One-third	16.11	14.56	16.63	212.6	3,536	6.47	162.9
P. O. J. 234	None	16.65	14.83	21.46	215.0	4,614		
	One-ninth	16.93	15.33	19.49	224.0	4,366	1.97	125.9
	Two-ninths	17.10	15.64	17.43	229.6	4,002	4.03	151.9
	One-third	17.17	15.83	15.19	233.3	3,544	6.27	170.7
Co. 281	None	17.58	15.46	29.07	222.7	6,474		
	One-ninth	17.94	16.04	26.37	233.0	6,144	2.70	122.2
	Two-ninths	18.15	16.43	23.58	240.1	5,662	5.49	147.9
	One-third	18.27	16.68	20.52	244.7	5,021	8.55	169.9
Co. 290	None	16.38	13.76	40.30	205.3	8,274		
	One-ninth	16.80	14.40	36.59	217.1	7,944	3.71	88.9
	Two-ninths	17.07	14.86	32.80	225.8	7,406	7.50	115.7
	One-third	17.30	15.29	28.45	234.1	6,660	11.85	136.2
C. P. 807	None	15.88	13.76	31.88	192.9	6,150		
	One-ninth	16.14	14.22	28.88	201.0	5,805	3.00	115.0
	Two-ninths	16.30	14.55	25.73	206.9	5,324	6.15	134.3
	One-third	16.44	14.83	22.41	212.0	4,751	9.47	147.7
C. P. 28/19	None	18.61	16.33	33.48	230.3	7,710		
	One-ninth	18.87	16.80	30.27	238.6	7,222	3.21	152.0
	Two-ninths	19.04	17.15	27.12	245.0	6,644	6.36	167.6
	One-third	19.16	17.40	23.60	249.5	5,888	9.88	184.4
Jan. 3, 1933:								
P. O. J. 213	None	14.92		23.38				
	One-ninth	15.10		21.25			2.13	
	Two-ninths	15.26		19.01			4.37	
	One-third	15.38	13.27	16.65	189.4	3,154	6.73	
P. O. J. 234	None	15.23		17.22				
	One-ninth	15.42		15.64			1.58	
	Two-ninths	15.51		13.97			3.25	
	One-third	15.61	13.09	12.23	184.1	2,252	4.99	
Co. 281	None	16.52		26.40				
	One-ninth	16.86		23.89			2.51	
	Two-ninths	17.07	15.20	21.30	220.3	4,692	5.10	
	One-third	17.21	15.50	18.40	225.9	4,157	8.00	
Co. 290	None	15.30		38.97				
	One-ninth	15.69		35.03			3.94	
	Two-ninths	15.92		31.21			7.76	
	One-third	16.20		27.12			11.85	
C. P. 807	None	14.63		29.19				
	One-ninth	14.95		26.50			2.69	
	Two-ninths	15.19	12.64	23.67	173.5	4,107	5.52	
	One-third	15.40	13.01	20.70	180.0	3,726	8.49	
C. P. 28/19	None	17.52		31.38				
	One-ninth	17.83	15.54	28.34	218.4	6,189	3.04	
	Two-ninths	18.05	15.89	25.35	224.5	5,691	6.03	
	One-third	18.22	16.25	21.59	231.0	4,987	9.79	

TABLE 6.—*Effect of topping sugarcane of different varieties on juice analyses and indicated yields of sugar from first-stubble cane on light soil, United States Sugar Plant Field Station, Houma, La., 1932–33*

Variety and date	Extent of topping (by length)	Mill cane					Discarded tops	
		Laboratory-mill juice analyses		Cane per acre	Indicated available 96° sugar		Cane per acre	Indicated available 96° sugar per ton of cane
		Brix	Sucrose		Per ton of cane	Per acre		
			Percent	*Tons*	*Pounds*	*Pounds*	*Tons*	*Pounds*
Oct. 14, 1932:								
P. O. J. 213	None	14.76	11.64	19.72	158.2	3,120		
	One-ninth	15.12	12.17	17.69	167.4	2,961	2.03	78.3
	Two-ninths	15.44	12.62	15.64	175.0	2,737	4.08	93.9
	One-third	15.69	12.98	13.55	181.2	2,455	6.17	107.8
P. O. J. 234	None	15.78	12.45	16.16	169.3	2,736		
	One-ninth	16.27	13.16	14.59	181.5	2,648	1.57	56.0
	Two-ninths	16.67	13.78	12.96	192.3	2,492	3.20	76.2
	One-third	16.97	14.26	11.28	200.7	2,264	4.88	96.7
Co. 281	None	15.59	12.19	22.31	164.9	3,679		
	One-ninth	16.10	12.87	20.24	176.3	3,568	2.07	53.6
	Two-ninths	16.57	13.52	17.98	187.3	3,368	4.33	71.8
	One-third	16.98	14.12	15.66	197.7	3,096	6.65	87.7
Co. 290	None	14.89	11.36	30.57	160.4	4,903		
	One-ninth	15.55	12.22	27.70	175.7	4,867	2.87	12.5
	Two-ninths	16.07	12.93	24.67	188.4	4,648	5.90	43.2
	One-third	16.48	13.49	21.49	198.5	4,266	9.08	70.2
C. P. 807	None	15.16	12.20	26.74	164.4	4,396		
	One-ninth	15.49	12.63	24.31	171.4	4,167	2.43	94.2
	Two-ninths	15.74	13.02	21.66	178.1	3,858	5.08	105.9
	One-third	15.93	13.33	18.99	183.5	3,485	7.75	117.5
Nov. 1, 1932:								
P. O. J. 213	None	16.07	13.46	18.60	189.2	3,519		
	One-ninth	16.44	14.00	16.65	198.5	3,305	1.95	109.7
	Two-ninths	16.64	14.30	14.84	203.7	3,023	3.76	131.9
	One-third	16.81	14.56	12.91	208.2	2,688	5.69	146.0
P. O. J. 234	None	16.68	13.93	16.52	195.5	3,230		
	One-ninth	17.20	14.64	14.79	207.5	3,069	1.73	93.1
	Two-ninths	17.55	15.18	12.89	216.9	2,796	3.63	119.6
	One-third	17.76	15.52	11.18	222.9	2,492	5.34	138.2
Co. 281	None	16.81	14.00	22.60	196.2	4,434		
	One-ninth	17.33	14.75	20.39	209.0	4,262	2.21	77.8
	Two-ninths	17.65	15.26	18.24	218.0	3,976	4.36	105.0
	One-third	17.90	15.56	15.82	222.9	3,526	6.78	133.9
Co. 290	None	16.06	13.07	31.08	191.7	5,958		
	One-ninth	16.70	13.89	27.69	206.1	5,707	3.39	74.0
	Two-ninths	17.10	14.47	24.62	216.7	5,335	6.46	96.4
	One-third	17.40	14.92	21.32	225.0	4,797	9.76	119.0
C. P. 807	None	16.34	13.85	30.59	191.9	5,870		
	One-ninth	16.69	14.38	27.68	201.0	5,564	2.91	105.2
	Two-ninths	16.90	14.71	24.72	206.6	5,107	5.87	130.0
	One-third	17.05	14.98	21.60	211.4	4,566	8.99	145.0
Nov. 15, 1932:								
P. O. J. 213	None	15.69	13.45	19.02	191.3	3,639		
	One-ninth	15.98	13.93	17.12	199.8	3,421	1.90	114.7
	Two-ninths	16.20	14.29	15.23	206.2	3,140	3.79	131.7
	One-third	16.31	14.49	13.26	209.8	2,782	5.76	148.8
P. O. J. 234	None	17.13	14.84	17.98	212.2	3,815		
	One-ninth	17.60	15.60	16.13	225.6	3,639	1.85	95.1
	Two-ninths	17.83	16.01	14.33	233.0	3,339	3.65	130.4
	One-third	17.94	16.24	12.41	237.3	2,945	5.57	156.2
Co. 281	None	17.03	14.56	22.87	206.8	4,730		
	One-ninth	17.51	15.33	20.58	220.4	4,536	2.29	84.7
	Two-ninths	17.78	15.77	18.41	228.2	4,201	4.46	118.6
	One-third	17.92	16.02	16.05	232.7	3,735	6.82	145.9
Co. 290	None	16.31	13.49	32.14	199.6	6,415		
	One-ninth	16.93	14.33	28.77	214.7	6,177	3.37	70.6
	Two-ninths	17.32	14.94	25.42	226.0	5,745	6.72	99.7
	One-third	17.60	15.37	21.89	233.9	5,120	10.25	126.3
C. P. 807	None	16.39	14.08	30.81	196.5	6,054		
	One-ninth	16.77	14.68	27.85	206.8	5,759	2.96	99.7
	Two-ninths	16.97	15.04	24.80	213.2	5,287	6.01	127.6
	One-third	17.07	15.24	21.81	216.8	4,728	9.00	147.3

TABLE 6.—*Effect of topping sugarcane of different varieties on juice analyses and indicated yields of sugar from first-stubble cane on light soil, United States Sugar Plant Field Station, Houma, La., 1932–33*—Continued

Variety and date	Extent of topping (by length)	Mill cane					Discarded tops	
		Laboratory-mill juice analyses		Cane per acre	Indicated available 96° sugar		Cane per acre	Indicated available 96° sugar per ton of cane
		Brix	Sucrose		Per ton of cane	Per acre		
			Percent	*Tons*	*Pounds*	*Pounds*	*Tons*	*Pounds*
Dec. 1, 1932:								
P. O. J. 213	None	15.46	13.21	17.71	187.6	3,322		
	One-ninth	15.69	13.62	15.99	195.0	3,118	1.72	118.6
	Two-ninths	15.87	13.93	14.15	200.5	2,837	3.56	136.2
	One-third	15.98	14.15	12.47	204.6	2,551	5.24	147.1
P. O. J. 234	None	16.57	14.25	16.36	203.0	3,321		
	One-ninth	16.90	14.83	14.72	213.4	3,141	1.64	109.8
	Two-ninths	17.07	15.17	13.14	219.7	2,887	3.22	134.8
	One-third	17.17	15.39	11.52	223.8	2,578	4.84	153.5
Co. 281	None	17.15	14.73	22.48	209.7	4,714		
	One-ninth	17.58	15.50	20.25	223.6	4,528	2.23	83.4
	Two-ninths	17.77	15.91	18.16	231.2	4,199	4.32	119.2
	One-third	17.86	16.14	15.92	235.6	3,751	6.56	146.8
Co. 290	None	16.71	13.91	31.27	206.5	6,457		
	One-ninth	17.24	14.69	28.17	220.8	6,220	3.10	76.5
	Two-ninths	17.57	15.23	25.08	230.9	5,791	6.19	107.6
	One-third	17.80	15.65	21.80	239.0	5,210	9.47	131.7
C. P. 807	None	16.52	13.85	26.80	190.8	5,113		
	One-ninth	16.80	14.34	24.36	199.5	4,860	2.44	103.7
	Two-ninths	16.96	14.61	21.82	204.2	4,456	4.98	131.9
	One-third	17.07	14.83	19.16	208.1	3,987	7.64	147.4
Dec. 15, 1932:								
P. O. J. 213	None	14.91	12.95	19.02	185.4	3,526		
	One-ninth	15.13	13.33	17.23	192.2	3,312	1.79	119.6
	Two-ninths	15.28	13.61	15.37	197.3	3,032	3.65	135.3
	One-third	15.37	13.78	13.39	200.4	2,683	5.63	149.7
P. O. J. 234	None	16.21	14.27	17.20	205.7	3,538		
	One-ninth	16.50	14.78	15.55	214.9	3,342	1.65	118.8
	Two-ninths	16.67	15.12	13.81	221.1	3,053	3.39	143.1
	One-third	16.77	15.32	12.01	224.8	2,700	5.19	161.5
Co. 281	None	17.00	14.65	24.17	208.9	5,049		
	One-ninth	17.32	15.21	21.95	219.0	4,807	2.22	109.0
	Two-ninths	17.52	15.61	19.51	226.3	4,415	4.66	136.1
	One-third	17.67	15.92	16.89	232.1	3,920	7.28	155.1
Co. 290	None	16.39	13.92	32.24	208.9	6,735		
	One-ninth	16.59	14.25	29.24	215.1	6,290	3.00	148.3
	Two-ninths	16.72	14.47	26.18	219.2	5,739	6.06	164.4
	One-third	16.88	14.71	22.86	223.6	5,111	9.38	173.1
C. P. 807	None	16.12	13.28	27.76	181.3	5,033		
	One-ninth	16.64	14.04	24.85	194.1	4,823	2.91	72.2
	Two-ninths	16.96	14.61	21.93	204.2	4,478	5.83	95.2
	One-third	17.22	15.06	18.85	212.1	3,998	8.91	116.2
Jan. 3, 1933:								
P. O. J. 213	None	13.71		16.83				
	One-ninth	13.95		15.15			1.68	
	Two-ninths	14.10		13.50			3.33	
	One-third	14.20	11.16	11.81	151.4	1,788	5.02	
P. O. J. 234	None	14.97		16.90				
	One-ninth	15.24		15.29			1.61	
	Two-ninths	15.47		13.17			3.73	
	One-third	15.56	13.16	11.41	185.9	2,121	5.49	
Co. 281	None	15.92		21.80				
	One-ninth	16.25		19.53			2.27	
	Two-ninths	16.46		17.35			4.45	
	One-third	16.58	14.51	15.04	208.6	3,137	6.76	
Co. 290	None	14.99		29.44				
	One-ninth	15.21		26.41			3.03	
	Two-ninths	15.38	13.17	23.38	198.5	4,641	6.06	
	One-third	15.51	13.46	20.23	204.2	4,131	9.21	
C. P. 807	None	14.99		26.34				
	One-ninth	15.21		23.92			2.42	
	Two-ninths	15.38	13.17	21.39	183.5	3,925	4.95	
	One-third	15.51	13.46	18.75	188.8	3,540	7.59	

TABLE 7.—*Effect of topping sugarcane of different varieties on juice analyses and indicated yields of sugar from plant cane on light soil, United States Sugar Plant Field Station, Houma, La., 1933–34*

Variety and date	Extent of topping (by length)	Mill cane					Discarded tops	
		Laboratory-mill juice analyses		Cane per acre	Indicated available 96° sugar		Cane per acre	Indicated available 96° sugar per ton of cane
		Brix	Sucrose		Per ton of cane	Per acre		
			Percent	*Tons*	*Pounds*	*Pounds*	*Tons*	*Pounds*
Oct. 13, 1933:								
P. O. J. 213	None	13. 27	9. 43	18. 87	120. 0	2, 264		
	One-ninth	13. 47	9. 78	17. 08	126. 2	2, 155	1. 79	60. 9
	Two-ninths	13. 73	10. 20	15. 15	133. 7	2, 026	3. 72	64. 0
	One-third	14. 05	10. 69	13. 11	142. 2	1, 864	5. 76	69. 4
P. O. J. 234	None	14. 55	11. 06	17. 83	147. 0	2, 621		
	One-ninth	14. 81	11. 49	15. 99	154. 7	2, 474	1. 84	79. 9
	Two-ninths	15. 10	11. 96	14. 17	163. 0	2, 310	3. 66	85. 0
	One-third	15. 42	12. 47	12. 20	171. 9	2, 097	5. 63	93. 1
Co. 281	None	13. 01	8. 59	18. 56	103. 5	1, 921		
	One-ninth	13. 55	9. 33	16. 67	116. 1	1, 935	1. 89	7. 4
	Two-ninths	14. 08	10. 08	14. 71	128. 9	1, 896	3. 85	6. 5
	One-third	14. 56	10. 79	12. 63	141. 2	1, 783	5. 93	23. 3
Co. 290	None	14. 36	10. 16	30. 90	136. 6	4, 221		
	One-ninth	14. 81	10. 78	27. 87	147. 8	4, 119	3. 03	33. 7
	Two-ninths	15. 26	11. 41	24. 65	159. 1	3, 922	6. 25	47. 8
	One-third	15. 65	11. 99	21. 19	169. 8	3, 598	9. 71	64. 2
C. P. 807	None	13. 70	9. 87	23. 06	124. 3	2, 866		
	One-ninth	13. 90	10. 28	20. 74	131. 6	2, 729	2. 32	59. 1
	Two-ninths	14. 18	10. 72	18. 29	139. 2	2, 546	4. 77	67. 1
	One-third	14. 44	11. 15	15. 66	146. 7	2, 297	7. 40	76. 9
C. P. 28/19	None	15. 52	11. 34	21. 13	144. 1	3, 045		
	One-ninth	15. 90	11. 92	19. 10	154. 0	2, 941	2. 03	51. 2
	Two-ninths	16. 22	12. 41	17. 00	162. 4	2, 761	4. 13	68. 8
	One-third	16. 48	12. 81	14. 71	169. 1	2, 487	6. 42	86. 9
Oct. 31, 1933:								
P. O. J. 213	None	13. 61	10. 47	19. 04	140. 2	2, 669		
	One-ninth	13. 77	10. 76	17. 61	145. 4	2, 560	1. 43	76. 2
	Two-ninths	13. 95	11. 10	15. 67	151. 6	2, 376	3. 37	86. 9
	One-third	14. 13	11. 41	13. 65	157. 2	2, 146	5. 39	97. 0
P. O. J. 234	None	14. 88	12. 31	20. 63	171. 9	3, 546		
	One-ninth	15. 16	12. 83	18. 59	181. 3	3, 370	2. 04	86. 3
	Two-ninths	15. 40	13. 31	16. 52	190. 1	3, 140	4. 11	98. 8
	One-third	15. 67	13. 82	14. 32	199. 4	2, 855	6. 31	109. 5
Co. 281	None	14. 08	10. 66	21. 03	141. 4	2, 974		
	One-ninth	14. 55	11. 32	18. 97	152. 6	2, 895	2. 06	38. 3
	Two-ninths	15. 01	12. 01	16. 95	164. 6	2, 790	4. 08	45. 1
	One-third	15. 37	12. 64	14. 72	175. 9	2, 589	6. 31	61. 0
Co. 290	None	14. 62	10. 93	32. 26	152. 4	4, 916		
	One-ninth	15. 13	11. 61	29. 09	164. 5	4, 785	3. 17	41. 3
	Two-ninths	15. 54	12. 15	26. 01	174. 2	4, 531	6. 25	61. 6
	One-third	15. 94	12. 73	22. 75	184. 8	4, 204	9. 51	74. 9
C. P. 807	None	14. 29	11. 48	26. 12	154. 5	4, 036		
	One-ninth	14. 57	11. 95	23. 60	162. 7	3, 840	2. 52	77. 8
	Two-ninths	14. 80	12. 20	21. 03	166. 6	3, 512	5. 04	104. 0
	One-third	14. 99	12. 56	18. 34	173. 0	3, 173	7. 78	110. 9
C. P. 28/19	None	16. 82	13. 77	25. 47	187. 4	4, 773		
	One-ninth	17. 27	14. 47	22. 93	199. 3	4, 570	2. 54	79. 9
	Two-ninths	17. 59	15. 00	20. 50	208. 5	4, 274	4. 97	100. 4
	One-third	17. 91	15. 55	17. 86	218. 1	3, 895	7. 61	115. 4
Nov. 14, 1933:								
P. O. J. 213	None	14. 65	11. 71	21. 21	160. 4	3, 402		
	One-ninth	14. 97	12. 19	19. 25	168. 7	3, 247	1. 96	79. 1
	Two-ninths	15. 23	12. 64	17. 01	176. 8	3, 007	4. 20	94. 0
	One-third	15. 48	13. 03	14. 84	183. 6	2, 725	6. 37	106. 3
P. O. J. 234	None	15. 62	12. 83	22. 01	178. 4	3, 927		
	One-ninth	15. 88	13. 28	19. 93	186. 5	3, 717	2. 08	101. 0
	Two-ninths	16. 14	13. 74	17. 56	194. 7	3, 419	4. 45	114. 2
	One-third	16. 34	14. 12	15. 19	201. 7	3, 064	6. 82	126. 5
Co. 281	None	14. 94	11. 16	21. 77	146. 8	3, 196		
	One-ninth	15. 37	11. 91	19. 79	160. 2	3, 170	1. 98	13. 1
	Two-ninths	15. 81	12. 62	17. 76	172. 7	3, 067	4. 01	32. 2
	One-third	16. 22	13. 32	15. 38	185. 2	2, 848	6. 39	54. 5
Co. 290	None	15. 00	11. 22	39. 08	156. 5	6, 116		
	One-ninth	15. 50	11. 92	35. 57	169. 2	6, 018	3. 51	27. 9
	Two-ninths	15. 93	12. 55	31. 56	180. 7	5, 703	7. 52	54. 9
	One-third	16. 28	13. 08	27. 34	190. 5	5, 208	11. 74	77. 3
C. P. 807	None	14. 62	11. 46	28. 04	152. 1	4, 265		
	One-ninth	14. 92	11. 91	25. 49	159. 7	4, 071	2. 55	76. 1
	Two-ninths	15. 21	12. 37	22. 57	167. 7	3, 785	5. 47	87. 8
	One-third	15. 40	12. 75	19. 50	174. 5	3, 403	8. 54	100. 9
C. P. 28/19	None	17. 58	14. 51	30. 15	198. 2	5, 976		
	One-ninth	18. 00	15. 18	27. 43	209. 8	5, 755	2. 72	81. 2
	Two-ninths	18. 40	15. 85	24. 34	221. 5	5, 391	5. 81	100. 7
	One-third	18. 68	16. 38	21. 23	231. 0	4, 904	8. 92	120. 2

TABLE 7.—*Effect of topping sugarcane of different varieties on juice analyses and indicated yields of sugar from plant cane on light soil, United States Sugar Plant Field Station, Houma, La., 1933–34*—Continued

Variety and date	Extent of topping (by length)	Mill cane					Discarded tops	
		Laboratory-mill juice analyses		Cane per acre	Indicated available 96° sugar		Cane per acre	Indicated available 96° sugar per ton of cane
		Brix	Sucrose		Per ton of cane	Per acre		
			Percent	*Tons*	*Pounds*	*Pounds*	*Tons*	*Pounds*
Dec. 1, 1933:								
P. O. J. 213	None	15.40	12.61	21.60	175.1	3,782		
	One-ninth	15.55	12.92	19.47	180.8	3,520	2.13	123.0
	Two-ninths	15.74	13.25	17.15	186.7	3,202	4.45	130.3
	One-third	15.90	13.54	14.88	191.9	2,855	6.72	137.9
P. O. J. 234	None	16.00	13.33	21.13	186.8	3,947		
	One-ninth	16.24	13.77	18.94	194.8	3,690	2.19	117.4
	Two-ninths	16.41	14.07	16.78	200.2	3,359	4.35	135.2
	One-third	16.58	14.39	14.66	206.0	3,020	6.47	143.3
Co. 281	None	16.19	13.30	24.67	185.0	4,564		
	One-ninth	16.65	13.97	22.23	196.5	4,368	2.44	80.3
	Two-ninths	16.99	14.53	19.81	206.4	4,089	4.86	97.7
	One-third	17.25	15.00	17.27	214.9	3,711	7.40	115.3
Co. 290	None	16.22	13.00	32.28	189.0	6,101		
	One-ninth	16.66	13.59	29.65	199.6	5,918	2.63	69.6
	Two-ninths	16.92	13.99	26.93	207.0	5,575	5.35	98.3
	One-third	17.12	14.31	24.08	213.0	5,129	8.20	118.5
C. P. 807	None	15.54	12.94	29.03	177.7	5,159		
	One-ninth	15.84	13.39	26.16	185.3	4,847	2.87	108.7
	Two-ninths	16.02	13.69	23.26	190.5	4,431	5.77	126.2
	One-third	16.19	13.96	20.33	195.2	3,968	8.70	136.9
C. P. 28/19	None	17.85	15.07	29.91	208.4	6,233		
	One-ninth	18.32	15.80	26.94	220.9	5,951	2.97	94.9
	Two-ninths	18.66	16.38	23.97	231.1	5,539	5.94	116.8
	One-third	18.89	16.79	20.89	238.3	4,978	9.02	139.1
Dec. 18, 1933:								
P. O. J. 213	None	16.06	13.71	23.41	194.6	4,556		
	One-ninth	16.23	14.04	21.17	200.6	4,247	2.24	137.9
	Two-ninths	16.39	14.31	18.82	205.4	3,866	4.59	150.3
	One-third	16.60	14.65	16.37	211.4	3,461	7.04	155.5
P. O. J. 234	None	16.54	14.14	22.23	200.8	4,464		
	One-ninth	16.72	14.51	19.95	207.7	4,144	2.28	140.3
	Two-ninths	16.93	14.85	17.61	213.7	3,763	4.62	151.7
	One-third	17.11	15.14	15.31	218.8	3,350	6.92	161.0
Co. 281	None	17.10	14.34	24.87	201.7	5,016		
	One-ninth	17.48	14.93	22.44	212.0	4,757	2.43	106.6
	Two-ninths	17.60	15.16	19.98	216.2	4,320	4.89	142.3
	One-third	17.73	15.43	17.36	221.2	3,840	7.51	156.6
Co. 290	None	16.82	13.70	39.20	201.0	7,879		
	One-ninth	17.23	14.27	35.68	211.2	7,536	3.52	97.4
	Two-ninths	17.54	14.74	31.75	219.9	6,982	7.45	120.4
	One-third	17.77	15.13	27.56	227.4	6,267	11.64	138.5
C. P. 807	None	16.08	13.37	32.13	183.5	5,896		
	One-ninth	16.40	13.92	29.05	193.1	5,610	3.08	92.9
	Two-ninths	16.62	14.31	25.71	199.9	5,139	6.42	117.9
	One-third	16.77	14.61	22.31	205.3	4,580	9.82	134.0
C. P. 28/19	None	18.76	15.93	30.49	221.0	6,738		
	One-ninth	19.16	16.66	27.42	233.9	6,414	3.07	105.5
	Two-ninths	19.45	17.18	24.38	243.1	5,927	6.11	132.7
	One-third	19.64	17.54	21.29	249.5	5,312	9.20	155.0
Jan. 2, 1934:								
P. O. J. 213	None	15.98	13.61	24.26	193.0	4,682		
	One-ninth	16.17	13.96	21.95	199.3	4,375	2.31	132.9
	Two-ninths	16.30	14.17	19.45	203.0	3,948	4.81	152.6
	One-third	16.37	14.29	16.93	205.1	3,472	7.33	165.1
P. O. J. 234	None	16.77	14.46	24.49	206.3	5,052		
	One-ninth	17.01	14.87	22.07	213.6	4,714	2.42	139.7
	Two-ninths	17.16	15.13	19.46	218.3	4,248	5.03	159.8
	One-third	17.32	15.41	16.83	223.3	3,758	7.66	168.9
Co. 281	None	17.44	14.88	26.02	211.1	5,493		
	One-ninth	17.80	15.41	23.59	220.3	5,197	2.43	121.8
	Two-ninths	18.04	15.80	20.97	227.2	4,764	5.05	144.4
	One-third	18.17	16.07	18.16	232.2	4,217	7.86	162.3
Co. 290	None	17.11	13.99	38.87	205.7	7,996		
	One-ninth	17.55	14.61	35.11	217.0	7,619	3.76	100.3
	Two-ninths	17.85	15.04	31.18	224.7	7,006	7.69	128.7
	One-third	18.02	15.36	27.05	231.0	6,249	11.82	147.8
C. P. 807	None	16.84	14.59	29.73	204.5	6,080		
	One-ninth	17.05	14.93	27.11	210.4	5,704	2.62	143.5
	Two-ninths	17.23	15.21	23.96	215.1	5,154	5.77	160.5
	One-third	17.39	15.47	20.65	219.6	4,535	9.08	170.2
C. P. 28/19	None	18.79	16.35	29.75	229.6	6,831		
	One-ninth	19.21	16.99	26.61	240.6	6,402	3.14	136.6
	Two-ninths	19.48	17.46	23.39	248.8	5,819	6.36	159.1
	One-third	19.68	17.82	20.13	255.2	5,137	9.62	176.1

TABLE 8.—*Effect of topping sugarcane of different varieties on juice analyses and indicated yields of sugar from first-stubble cane on light soil, United States Sugar Plant Field Station, Houma, La., 1933–34*

Variety and date	Extent of topping (by length)	Mill cane					Discarded tops	
		Laboratory-mill juice analyses		Cane per acre	Indicated available 96° sugar		Cane per acre	Indicated available 96° sugar per ton of cane
		Brix	Sucrose		Per ton of cane	Per acre		
			Percent	*Tons*	*Pounds*	*Pounds*	*Tons*	*Pounds*
Oct. 13, 1933:								
P. O. J. 213	None	13.05	9.08	26.87	113.8	3,058		
	One-ninth	13.33	9.47	24.35	120.5	2,934	2.52	49.2
	Two-ninths	13.68	9.94	21.65	128.4	2,780	5.22	53.3
	One-third	14.07	10.43	18.76	136.5	2,561	8.11	61.3
P. O. J. 234	None	12.96	9.06	19.76	114.0	2,253		
	One-ninth	13.59	9.46	17.99	118.6	2,134	1.77	67.2
	Two-ninths	13.91	9.92	15.99	126.5	2,023	3.77	61.0
	One-third	14.19	10.36	13.82	134.2	1,855	5.94	67.0
Co. 281	None	13.35	9.46	23.88	120.1	2,868		
	One-ninth	13.66	9.91	21.56	127.9	2,758	2.32	47.4
	Two-ninths	14.05	10.47	19.13	137.5	2,630	4.75	50.1
	One-third	14.38	10.99	16.51	146.6	2,420	7.37	60.8
Co. 290	None	14.67	10.60	36.55	144.6	5,285		
	One-ninth	15.09	11.15	33.28	154.3	5,135	3.27	45.9
	Two-ninths	15.49	11.72	29.67	164.7	4,887	6.88	57.8
	One-third	15.86	12.26	25.70	174.5	4,485	10.85	73.7
C. P. 807	None	13.12	9.32	33.69	116.2	3,915		
	One-ninth	13.44	9.74	30.98	123.1	3,814	2.71	37.3
	Two-ninths	13.79	10.23	27.79	131.3	3,649	5.90	45.1
	One-third	14.34	10.85	24.23	141.0	3,416	9.46	52.7
C. P. 28/19	None	16.12	12.23	24.07	159.2	3,832		
	One-ninth	16.43	12.76	21.93	168.4	3,693	2.14	65.0
	Two-ninths	16.80	13.38	19.57	179.2	3,507	4.50	72.2
	One-third	17.21	14.03	16.90	190.4	3,218	7.17	85.6
Oct. 31, 1933:								
P. O. J. 213	None	14.52	11.47	25.98	156.0	4,053		
	One-ninth	14.81	11.91	23.31	163.7	3,816	2.67	88.8
	Two-ninths	15.13	12.37	20.73	171.6	3,557	5.25	94.5
	One-third	15.42	12.82	17.89	179.5	3,211	8.09	104.1
P. O. J. 234	None	14.13	10.65	22.41	140.8	3,155		
	One-ninth	14.45	11.06	20.39	147.7	3,012	2.02	70.8
	Two-ninths	14.71	11.46	18.20	154.6	2,814	4.21	81.0
	One-third	15.03	11.94	15.83	163.0	2,580	6.58	87.4
Co. 281	None	13.92	10.44	25.72	137.6	3,539		
	One-ninth	14.30	11.06	23.15	148.6	3,440	2.57	38.5
	Two-ninths	14.60	11.56	20.61	157.5	3,246	5.11	57.3
	One-third	14.85	12.01	17.91	165.6	2,966	7.81	73.4
Co. 290	None	15.46	11.86	38.06	168.1	6,398		
	One-ninth	15.93	12.50	34.31	179.6	6,162	3.75	62.9
	Two-ninths	16.25	12.98	30.59	188.4	5,763	7.47	85.0
	One-third	16.48	13.35	26.98	195.2	5,266	11.08	102.2
C. P. 807	None	13.60	10.41	31.96	136.2	4,353		
	One-ninth	13.95	10.85	28.99	143.4	4,157	2.97	66.0
	Two-ninths	14.27	11.27	25.98	150.2	3,902	5.98	75.4
	One-third	14.57	11.69	22.71	157.3	3,572	9.25	84.4
C. P. 28/19	None	16.66	13.52	26.35	183.1	4,825		
	One-ninth	17.06	14.20	23.88	194.9	4,654	2.47	69.2
	Two-ninths	17.51	14.77	21.33	204.1	4,353	5.02	94.0
	One-third	17.95	15.51	18.05	217.1	3,919	8.30	109.2
Nov. 14, 1933:								
P. O. J. 213	None	14.66	11.54	23.50	156.7	3,682		
	One-ninth	14.91	11.96	21.37	164.1	3,507	2.13	82.2
	Two-ninths	15.17	12.36	18.89	171.1	3,232	4.61	97.6
	One-third	15.47	12.82	16.34	179.1	2,926	7.16	105.6
P. O. J. 234	None	15.25	12.21	22.20	167.4	3,716		
	One-ninth	15.53	12.64	20.21	174.9	3,535	1.99	91.0
	Two-ninths	15.77	13.03	18.00	181.8	3,272	4.20	105.7
	One-third	15.93	13.34	15.68	187.5	2,940	6.52	119.0
Co. 281	None	15.03	11.69	26.10	157.6	4,113		
	One-ninth	15.33	12.17	23.82	166.0	3,954	2.28	69.7
	Two-ninths	15.66	12.73	21.04	176.0	3,703	5.06	81.0
	One-third	15.90	13.16	18.13	183.8	3,332	7.97	98.0
Co. 290	None	16.05	12.47	38.90	178.1	6,928		
	One-ninth	16.46	13.05	35.62	188.6	6,718	3.28	64.0
	Two-ninths	16.79	13.54	31.68	197.6	6,260	7.22	92.5
	One-third	17.05	13.96	27.51	205.4	5,651	11.39	112.1

TABLE 8.—*Effect of topping sugarcane of different varieties on juice analyses and indicated yields of sugar from first-stubble cane on light soil, United States Sugar Plant Field Station, Houma, La., 1933–34*—Continued

Variety and date	Extent of topping (by length)	Mill cane					Discarded tops	
		Laboratory-mill juice analyses		Cane per acre	Indicated available 96° sugar		Cane per acre	Indicated available 96° sugar per ton of cane
		Brix	Sucrose		Per ton of cane	Per acre		
			Percent	*Tons*	*Pounds*	*Pounds*	*Tons*	*Pounds*
Nov. 14, 1933—Con.								
C. P. 807	None	14.87	11.97	35.40	161.3	5,710		
	One-ninth	15.12	12.41	32.44	169.0	5,482	2.96	77.0
	Two-ninths	15.39	12.84	29.03	176.5	5,124	6.37	92.0
	One-third	15.65	13.26	25.25	183.7	4,638	10.15	105.6
C. P. 28/19	None	17.91	14.90	29.92	204.4	6,116		
	One-ninth	18.27	15.51	27.44	215.1	5,902	2.48	86.3
	Two-ninths	18.63	16.11	24.43	225.6	5,511	5.49	110.2
	One-third	18.91	16.61	21.23	234.4	4,976	8.69	131.2
Dec. 1, 1933:								
P. O. J. 213	None	16.08	13.16	26.80	182.6	4,894		
	One-ninth	16.26	13.48	24.17	188.4	4,554	2.63	129.3
	Two-ninths	16.38	13.71	21.59	192.6	4,158	5.21	141.3
	One-third	16.56	14.02	18.87	198.1	3,738	7.93	145.8
P. O. J. 234	None	15.76	12.75	23.14	175.8	4,068		
	One-ninth	15.90	13.01	21.12	180.6	3,814	2.02	125.7
	Two-ninths	16.02	13.25	18.97	185.0	3,509	4.17	134.1
	One-third	16.11	13.45	16.62	188.7	3,136	6.52	142.9
Co. 281	None	16.52	13.57	22.96	188.7	4,333		
	One-ninth	16.82	14.14	20.61	199.1	4,103	2.35	97.9
	Two-ninths	17.00	14.49	18.30	205.5	3,761	4.66	122.7
	One-third	17.12	14.76	15.89	210.6	3,346	7.07	139.6
Co. 290	None	17.40	14.18	39.34	208.1	8,187		
	One-ninth	17.74	14.65	35.58	216.6	7,707	3.76	127.7
	Two-ninths	17.93	14.98	31.87	222.8	7,101	7.47	145.4
	One-third	18.10	15.28	28.02	228.5	6,403	11.32	157.6
C. P. 807	None	15.33	12.42	34.00	168.0	5,712		
	One-ninth	15.56	12.79	30.87	174.3	5,381	3.13	105.7
	Two-ninths	15.77	13.12	27.86	180.0	5,015	6.14	113.5
	One-third	15.95	13.44	24.46	185.7	4,542	9.54	122.6
C. P. 28/19	None	18.02	15.12	27.98	208.4	5,831		
	One-ninth	18.33	15.63	25.30	217.3	5,498	2.68	124.3
	Two-ninths	18.60	16.10	22.55	225.5	5,085	5.43	137.4
	One-third	18.81	16.51	19.83	232.9	4,618	8.15	148.8
Dec. 18, 1933:								
P. O. J. 213	None	17.10	14.52	28.40	205.5	5,836		
	One-ninth	17.19	14.68	25.50	208.4	5,314	2.90	180.0
	Two-ninths	17.21	14.80	22.59	210.9	4,764	5.81	184.5
	One-third	17.22	14.88	19.64	212.5	4,173	8.76	189.8
P. O. J. 234	None	16.47	13.62	22.51	190.1	4,279		
	One-ninth	16.69	14.02	20.49	197.3	4,043	2.02	116.8
	Two-ninths	16.88	14.37	18.31	203.7	3,730	4.20	130.7
	One-third	17.15	14.78	15.98	210.8	3,369	6.53	139.4
Co. 281	None	16.86	14.04	27.18	196.7	5,346		
	One-ninth	17.10	14.55	24.58	206.2	5,068	2.60	106.9
	Two-ninths	17.22	14.83	21.93	211.4	4,636	5.25	135.2
	One-third	17.30	15.04	19.05	215.5	4,105	8.13	152.6
Co. 290	None	17.88	14.66	39.85	215.9	8,604		
	One-ninth	18.17	15.12	36.29	224.5	8,147	3.56	128.4
	Two-ninths	18.41	15.50	32.48	231.5	7,519	7.37	147.2
	One-third	18.60	15.85	28.46	238.3	6,782	11.39	160.0
C. P. 807	None	15.64	12.33	37.26	164.2	6,118		
	One-ninth	15.83	12.61	34.18	169.0	5,776	3.08	111.0
	Two-ninths	16.08	12.97	30.85	175.0	5,399	6.41	112.2
	One-third	16.33	13.34	27.16	181.3	4,924	10.10	118.2
C. P. 28/19	None	18.60	15.70	35.07	217.1	7,614		
	One-ninth	18.95	16.35	31.64	228.6	7,233	3.43	111.1
	Two-ninths	19.19	16.79	28.16	236.5	6,660	6.91	138.1
	One-third	19.35	17.12	24.67	242.4	5,980	10.40	157.1
Jan. 2, 1934:								
P. O. J. 213	None	16.43	13.48	26.84	187.3	5,027		
	One-ninth	16.54	13.71	24.23	191.6	4,642	2.61	147.5
	Two-ninths	16.65	13.90	21.43	195.0	4,179	5.41	156.7
	One-third	16.77	14.12	18.59	199.0	3,699	8.25	161.0
P. O. J. 234	None	17.03	14.43	24.83	204.0	5,065		
	One-ninth	17.18	14.72	22.62	209.3	4,734	2.21	149.8
	Two-ninths	17.35	14.97	20.19	213.6	4,313	4.64	162.1
	One-third	17.52	15.27	17.67	219.0	3,870	7.16	166.9

TABLE 8.—*Effect of topping sugarcane of different varieties on juice analyses and indicated yields of sugar from first-stubble cane on light soil, United States Sugar Plant Field Station, Houma, La., 1933–34*—Continued

Variety and date	Extent of topping (by length)	Mill cane					Discarded tops	
		Laboratory-mill juice analyses		Cane per acre	Indicated available 96° sugar		Cane per acre	Indicated available 96° sugar per ton of cane
		Brix	Sucrose		Per ton of cane	Per acre		
Jan. 2, 1934—Con.			*Percent*	*Tons*	*Pounds*	*Pounds*	*Tons*	*Pounds*
Co. 281	None	17.68	15.08	29.43	213.9	6,295		
	One-ninth	17.86	15.39	26.76	219.5	5,874	2.67	157.7
	Two-ninths	17.91	15.52	23.88	222.0	5,301	5.55	179.1
	One-third	17.92	15.62	20.82	224.1	4,666	8.61	189.2
Co. 290	None	18.70	15.74	44.18	235.1	10,387		
	One-ninth	19.00	16.22	39.95	244.0	9,748	4.23	151.1
	Two-ninths	19.16	16.51	35.80	249.6	8,936	8.38	173.1
	One-third	19.30	16.78	31.35	254.8	7,988	12.83	187.0
C. P. 807	None	16.13	13.15	35.84	178.4	6,394		
	One-ninth	16.36	13.33	32.78	180.9	5,930	3.06	151.6
	Two-ninths	16.58	13.66	29.40	186.5	5,483	6.44	141.5
	One-third	16.81	14.01	25.81	192.5	4,968	10.03	142.2
C. P. 28/19	None	19.39	16.93	31.52	238.2	7,508		
	One-ninth	19.75	17.52	28.55	248.4	7,092	2.97	140.1
	Two-ninths	20.01	17.97	25.48	256.4	6,533	6.04	161.4
	One-third	20.16	18.29	22.43	262.1	5,879	9.09	179.2

It is apparent from a consideration of the detailed results given in tables 4 to 8 that the most advantageous benefits of topping may be expected from comparatively immature cane, as judged by the relative increase in indicated yield of sugar per ton of cane and by the amount of available sugar in portions of the stalk discarded. Due to the advanced condition of the crop at the beginning of studies during 1932, stubble cane on light soil and plant cane on heavy soil had reached a stage of maturity at which not much, if any, of the stalk as usually harvested could be advantageously discarded.

Whole-stalk juice analyses on October 14, 1932, from plant cane on light soil, however, showed C. P. 807, Co. 290, and P. O. J. 213 to be comparatively immature. By discarding the upper one-third (approximately 30 percent by weight), the indicated yield of sugar per ton of cane was increased from 139.4 to 161.5 with P. O. J. 213, from 133.4 to 163.1 with Co. 290, and from 118.2 to 139.0 with C. P. 807. In this test Co. 281, while showing a higher percentage of sucrose in juice and a greater indicated yield of sugar per ton of cane than P. O. J. 213 on the basis of the whole stalk, gave a lesser indicated yield of sugar per ton of cane in the upper portions of the stalk. Likewise, Co. 290, while not much lower than P. O. J. 213 in indicated yield of sugar per ton of cane from whole stalks, showed an indicated yield of 31.8 pounds of sugar per ton of cane from the upper one-ninth as compared with 56.1 pounds from corresponding stalk segments of P. O. J. 213. On November 1 most of the varieties in this test had reached a stage of maturity at which extensive topping would probably be considered inadvisable, but even under such conditions, Co. 290 and Co. 281 again showed relatively immature tops in comparison with other varieties in the tests.

On October 13, 1933, most of the varieties in both plant-cane and first-stubble tests were comparatively immature and, therefore, at a stage in which topping is of extreme importance. With P. O. J. 213 showing indicated yields of sugar per ton of cane of only 120.0 pounds from plant cane and 113.8 pounds from first stubble, topping was of exceedingly questionable effectiveness in view of the comparatively little improvement in juice analysis for the sacrifice in tonnage involved. A somewhat similar response was shown by P. O. J. 234, although topping plant cane of this variety from 10 to 20 percent would have greatly improved its sale value under the usual cane-purchase contract. Whole stalk juice analyses of Co. 281 on October 13, 1933, indicated a very low level of maturity. With this variety, indicated yields of sugar per ton of cane were raised from 103.5 to 141.2 pounds in the case of plant cane and from 120.1 to 146.6 in the case of first stubble by discarding the upper one-third of the stalk. Discarding the upper one-ninth of plant-cane stalks resulted in a slight net increase in available sugar per acre. This increase may be accounted for by the very low purity of the juice from the portion discarded, calculation of which showed that it was lower than the purity ordinarily assumed for final molasses.

Indicated yields of sugar per ton of cane from whole stalks of Co. 290, both plant and stubble, were among the highest in each group at each date, but the low indicated yields from the top portion of the stalk, which were consistently among the lowest in each group, indicate that this variety would have given a satisfactory response to topping in that, especially early in the season, discarding 10 to 20 percent of the stalk would have resulted in a marked improvement in the quality of the juice, with but comparatively small decrease in yield of sugar per acre. C. P. 807 gave an amount of sugar per ton of cane which did not differ to any great extent from the yields from P. O. J. 213 at corresponding dates. Each variety showed a very similar response to topping, the results indicating that in the case of cane harvested early in the season, discarding upwards of 10 percent of the stalk would have been advantageous. C. P. 28/19 showed slightly lower indicated yields of sugar per ton of cane in the upper part of the stalk than the yields from corresponding portions of the stalk of P. O. J. 234, indicating that, as between the two varieties, there would have been some advantage in discarding a slightly greater proportion of the top of the former. However, in view of the consistently high levels of maturity attained in the case of C. P. 28/19 severe topping of this variety would not have been justified at any period covered by these studies.

With the advance of maturity, differences in percentage of available sugar in juice from different portions of the stalk became progressively less pronounced in all varieties. This is illustrated by the data given in tables 9 and 10, the effectiveness of topping, as measured by the percentage of increase in available sugar per ton of cane, gradually diminishing with the rise in sugar content of the juice. This was apparent in all tests, but particularly so during the harvest of 1933–34 when the relationship was not complicated by the effects of freeze injury. During that season, topping back P. O. J. 213 approximately 10 percent by weight, at sucrose contents in juice ranging between 9.01 and 9.50, resulted in an average increase in indicated yield of sugar per ton of cane of 5.53 percent. At sucrose contents within

the range of 14.51 to 15 percent, however, discarding the corresponding top portion of the cane resulted in an increase of only 1.41 percent in indicated yield of sugar per ton of cane. With Co. 281, topping 10 percent by weight at sucrose contents of the juice between 8.51 and 9 gave an increase in available sugar per ton of cane of over 12 percent, while corresponding topping within the range of 15.01 to 15.50 percent sucrose in juice of the whole stalk gave an average increase of only 2.62 percent. Without a single exception, Co. 281, with a given degree of topping, showed a greater percentage increase in available sugar per ton of cane than was observed with P. O. J. 213 at the same level of sucrose content. Topping Co. 290 resulted in increases in available sugar per ton of cane generally similar to those obtained with Co. 281 at the same level of sucrose in juice. C. P. 807 and P. O. J. 234 appeared to possess properties similar to those displayed by P. O. J. 213, as regards the relative distribution of available sugar in different portions of the stalk. C. P. 28/19 had reached a comparatively advanced stage of maturity when the first analyses of the season were made and, therefore, little information is available regarding its response to topping when in an immature condition.

TABLE 9.—*Average percentage increase in indicated yields of sugar per ton of mill cane of different varieties at different sucrose contents of juice, obtained by discarding the top one-ninth of the stalk by length (approximately 10 percent by weight)*

1932–33

Sucrose in juice of whole stalk (percent)	P. O. J. 213	P. O. J. 234	Co. 281	Co. 290	C. P. 807	C. P. 28/19
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
8.51 to 9						
9.01 to 9.50					7.17	
9.51 to 10				7.93		
10.01 to 10.50						
10.51 to 11	6.82					
11.01 to 11.50				6.76	5.66	
11.51 to 12					5.80	
12.01 to 12.50	5.59	5.94	7.32	6.95	4.50	
12.51 to 13	3.70			6.67	2.70	
13.01 to 13.50	4.33		5.82	7.38	5.81	
13.51 to 14	4.67	5.57	6.57	6.52	4.20	
14.01 to 14.50	4.70	4.80		6.00	5.20	
14.51 to 15	4.10	5.03	6.09			7.20
15.01 to 15.50		5.18	5.43			6.00
15.51 to 16		4.75	4.47			4.70
16.01 to 16.50						5.72
16.51 to 17						

1933–34

8.51 to 9			12.17			
9.01 to 9.50	5.53	4.03	6.49		5.90	
9.51 to 10					5.87	
10.01 to 10.50	3.71		7.99	8.20	5.29	
10.51 to 11		4.90	7.92	7.34		
11.01 to 11.50	5.00	5.24	9.13	7.98	5.15	6.87
11.51 to 12	4.94		5.33	6.84	4.77	
12.01 to 12.50		2.45		5.89	3.33	5.85
12.51 to 13	3.26	3.63		5.61	4.28	
13.01 to 13.50	2.74	4.28	6.22		3.31	
13.51 to 14	3.17	3.79	5.51	5.28		6.39
14.01 to 14.50		3.19	4.97	4.08		
14.51 to 15	1.41		4.36	3.98	2.88	5.54
15.01 to 15.50			2.62			5.13
15.51 to 16				3.79		5.57
16.01 to 16.50						4.79
16.51 to 17						4.28

TABLE 10.—*Average percentage increase in indicated yields of sugar per ton of mill cane of different varieties at different sucrose contents of juice, obtained by discarding the top two-ninths of the stalk by length (approximately 20 percent by weight)*

1932–33

Sucrose in juice of whole stalk (percent)	P. O. J. 213	P. O. J. 234	Co. 281	Co. 290	C. P. 807	C. P. 28/19
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
8.51 to 9						
9.01 to 9.50					12.79	
9.51 to 10				15.60		
10.01 to 10.50						
10.51 to 11	11.81					
11.01 to 11.50				12.01	9.47	
11.51 to 12					9.10	
12.01 to 12.50	8.25	11.32	13.57	12.05	7.60	
12.51 to 13	6.40			11.19	6.78	
13.01 to 13.50	6.00		9.68	12.95	9.25	
13.51 to 14	7.37	9.60	11.14	11.16	6.97	
14.01 to 14.50	7.30	7.73		10.40	8.50	
14.51 to 15	6.70	7.86	9.74			12.41
15.01 to 15.50		8.65	8.99			10.70
15.51 to 16		7.60	7.71			8.40
16.01 to 16.50						6.36
16.51 to 17						

1933–34

8.51 to 9			24.54			
9.01 to 9.50	12.12	10.96	14.49		12.90	
9.51 to 10					11.99	
10.01 to 10.50	8.13		14.46	16.47	10.28	
10.51 to 11		9.80	16.41	14.11		
11.01 to 11.50	10.00	10.88	17.64	15.31	9.04	12.70
11.51 to 12	9.70		11.67	12.08	9.42	
12.01 to 12.50		9.59		10.95	6.86	12.62
12.51 to 13	6.62	7.18		9.52	7.20	
13.01 to 13.50	4.79	7.17	11.57		6.74	
13.51 to 14	5.36	7.15	8.90	9.32		11.36
14.01 to 14.50		5.65	7.33	7.06		
14.51 to 15	2.63		7.63	7.23	5.18	11.06
15.01 to 15.50			3.79			9.55
15.51 to 16				6.17		9.47
16.01 to 16.50						8.36
16.51 to 17						7.64

While the relative maturity of the top portion contrasted with the rest of the stalk is undoubtedly more influenced by vegetative activities of the plant, particularly in response to weather conditions, there is an unquestionable tendency for the sugar content of the upper part of the stalk to increase at an accelerated rate as the season advances, in comparison with the remaining portion of the stalk. However, the relationship is not absolute, the results secured indicating that the relative rate of ripening in Louisiana of the whole stalk and of the upper portion of the stalk depends to a large extent on varietal characteristics and prevailing weather conditions throughout the latter part of the growing season.

For early-season cane deliveries, Louisiana growers have been largely dependent on the early-maturing, but otherwise, extremely unsatisfactory variety, P. O. J. 234. One of the practical aspects of these studies was an inquiry into the possibility of economically utilizing during such periods high-yielding, though late-maturing, varieties by discarding immature portions of the stalk. Table 11 gives indicated yields of sugar per acre at dates between mid-October and early December from plant cane and first stubble of important varieties of sugarcane topped so as to give an approximate minimum of 160 pounds of sugar per ton of cane, and the approximate per-

centage of the weight of the stalk which had to be discarded in order to obtain cane of that quality.

TABLE 11.—*Extent of topping required to afford an approximate minimum of 160 pounds of 96° sugar per ton of cane of different varieties at different dates during early grinding and the indicated yield of sugar per acre from cane so topped, as observed in tests during 1932 and 1933*

PLANT-CANE TESTS ON LIGHT SOIL

Variety	1932								1933							
	Approximate percentage (by weight) of whole stalk [1] discarded in topping				Indicated available 96° sugar per acre from topped cane				Approximate percentage (by weight) of whole stalk [1] discarded in topping				Indicated available 96° sugar per acre from topped cane			
	Oct. 14	Nov. 1	Nov. 15	Dec. 1	Oct. 14	Nov. 1	Nov. 15	Dec. 1	Oct. 13	Oct. 31	Nov. 14	Dec. 1	Oct. 13	Oct. 31	Nov. 14	Dec. 1
					Lb.	*Lb.*	*Lb.*	*Lb.*					*Lb.*	*Lb.*	*Lb.*	*Lb.*
P. O. J. 213	30	0	0	0	2,390	3,831	4,681	4,099	30+	30+	0	0	------	------	3,402	3,782
P. O. J. 234	0	0	0	0	3,645	4,521	5,045	5,173	20	0	0	0	2,310	3,546	3,927	3,947
Co. 281	0	0	0	0	4,109	4,979	5,962	5,998	30+	20	10	0	------	2,790	3,170	4,564
Co. 290	30	10	0	0	4,033	5,389	6,455	6,517	20	10	10	0	3,922	4,785	6,018	6,101
C. P. 807	[2]30+	20	10	0	------	4,274	5,606	5,397	30+	10	10	0	------	3,840	4,071	5,159
C. P. 28/19	-----	----	----	----	------	------	------	------	20	0	0	0	2,761	4,773	5,976	6,223

FIRST-STUBBLE TESTS ON LIGHT SOIL

P. O. J. 213	10	0	0	0	2,961	3,519	3,639	3,322	30+	10	10	0	------	3,816	3,507	4,894
P. O. J. 234	0	0	0	0	2,736	3,230	3,815	3,321	30+	30	0	0	------	2,580	3,716	4,068
Co. 281	0	0	0	0	3,679	4,434	4,730	4,714	30+	30	10	0	------	2,966	3,954	4,333
Co. 290	0	0	0	0	4,903	5,958	6,415	6,457	20	0	0	0	4,887	6,398	6,928	8,187
C. P. 807	0	0	0	0	4,396	5,870	6,054	5,113	30+	30+	0	0	------	------	5,710	5,712
C. P. 28/19	-----	----	----	----	------	------	------	------	0	0	0	0	3,832	4,825	6,116	5,831

[1] Whole stalk as harvested according to ordinary plantation practice.

[2] Effect of removal of greater than 30 percent of the top portion of the stalks was not determined. Instances in which discarding a maximum of 30 percent did not bring the indicated yield of sugar from the remaining cane to the specified minimum are indicated by 30+.

These studies reveal rather strikingly that the large yields of cane afforded by Co. 290, together with the characteristically high concentration of sugar in the lower portions of its stalk in comparison with that in the upper portions, offer early milling possibilities not fully appreciated from a consideration of whole-stalk-juice analyses alone. There was not a single instance in which this variety did not afford indicated yields of sugar per acre considerably in excess of corresponding ones from P. O. J. 234 when each variety was topped in such manner as to give an indicated minimum of 160 pounds of sugar per ton of cane, or when it was necessary to top Co. 290 only. The average difference in the case of plant-cane tests on October 14 and November 1, 1932, and on October 13 and October 31, 1933, was slightly more than 1,000 pounds in favor of Co. 290. Its indicated yield of sugar per acre from cane topped in such manner as to secure 160 pounds of sugar per ton was either approximately equal to or in excess of the corresponding yield from C. P. 28/19, the average difference in four direct comparisons at dates between October 13 and November 14, 1933, amounting to 568 pounds in favor of Co. 290.[5]

[5] The utilization of a high-tonnage variety in this manner does not necessarily result in a net gain equal to the increase in sugar over a moderate-tonnage but sweeter variety. There would be a slight increase in the fertilizer and labor cost of producing the high-tonnage variety.

Under favorable growing conditions during 1932, Co. 281 with normal topping gave cane of high quality as early as October 14. During 1933, under unfavorable growing conditions, this variety proved very immature. On October 13 its indicated yield of sugar per ton of cane could not be brought to the prescribed minimum of 160 pounds even by discarding as much as 30 percent of the top portion of the stalk. On October 31 it would have been necessary to have discarded approximately 20 percent of the plant cane and approximately 30 percent of the first stubble in order to obtain cane of this minimum quality. Normal topping would have sufficed for plant cane of P. O. J. 234, but it would have been necessary to have discarded 30 percent of the stubble cane of this variety. When topped thus Co. 281 gave an indicated yield of sugar per acre 756 pounds less than the yield from P. O. J. 234, in the case of the plant cane, but 386 pounds more than the yield from the latter in the case of the stubble. Co. 281 made a relatively better showing at later dates and on December 1, when normal topping of either variety gave 160 pounds of sugar per ton of cane, both plant and stubble cane gave a higher indicated yield of sugar per acre than corresponding yields from P. O. J. 234. However, Co. 281, when topped sufficiently to give 160 pounds of sugar per ton of cane, consistently yielded less sugar per acre than C. P. 28/19, plant cane topped 20 percent on October 31, 1933, having shown 1,983 pounds less than normally topped plant cane of C. P. 28/19, and stubble topped 30 percent, having shown 1,859 pounds less than normally topped stubble of C. P. 28/19.

C. P. 28/19 had reached a very satisfactory level of maturity on October 13, 1933, whole-stalk-juice analyses having indicated a yield of 144.1 pounds of sugar per ton of plant cane and 159.2 pounds per ton of stubble cane. On that date it would have been necessary to have discarded approximately 20 percent of the plant cane in order to secure 160 pounds of sugar per ton, but normal topping would have sufficed in the case of the stubble. On all subsequent dates normally topped cane of this variety, both plant and stubble, showed an indicated yield in excess of 160 pounds of sugar per ton.

Under conditions prevailing in 1932, P. O. J. 234, both plant and first stubble, attained a very satisfactory level of maturity; for as early as October 14 normally topped cane was of high milling value. However, under the conditions prevailing in 1933 first stubble of this variety proved comparatively immature. On October 13, 1933, it was necessary to discard approximately 20 percent of the plant cane in order to secure a minimum of 160 pounds of sugar per ton. On that date its yield of sugar per acre corresponded closely to the yield from similarly topped C. P. 28/19. On subsequent dates normal topping sufficed in the case of either variety, but in each instance the yield of sugar per acre from C. P. 28/19 was greatly in excess of the yield from P. O. J. 234. Immaturity of the first stubble of P. O. J. 234 in 1933 is indicated by the fact that even as late as October 31 it was necessary to discard 30 percent of the cane in order to secure a minimum of 160 pounds of sugar per ton. Normally topped C. P. 28/19 on that date, and also on October 13, afforded cane of equal, or superior, value. On October 31, normally topped C. P. 28/19 showed an indicated yield of approximately 2,200 pounds more sugar per acre than P. O. J. 234, which had been topped in such

manner as to give 160 pounds of sugar per ton. On subsequent dates normal topping of either variety proved adequate but, as in the case of the plant cane, the yield of sugar from C. P. 28/19 was consistently much greater than the yield from P. O. J. 234. The retarded maturity of P. O. J. 234 in this experiment was undoubtedly due to the fact that the cane had lodged very badly, a characteristic of this variety which is often overlooked in appraising its value for early milling, because under conditions of severe lodging it frequently proves the most immature of the commercial varieties.

The results indicate that, in comparison with other varieties, C. P. 807 and P. O. J. 213 are unsuitable for milling in October and early in November. In 1932 normally topped C. P. 807 first stubble gave very satisfactory yields of sugar per ton of cane and per acre even as early as October 14 and November 1, but in the case of plant cane tests in 1932 and of both plant and stubble tests in 1933 the cane was very immature on corresponding dates, as shown by the necessity for severely topping it in order to secure a yield of 160 pounds of sugar per ton. However, the suitability of C. P. 807 for later milling is indicated by the results of tests in mid-November and early in December which show that, in most instances, normal topping resulted in cane of good milling quality, and that this variety gave satisfactory yields of sugar per acre. Generally similar results are shown for P. O. J. 213, though in the case of this variety the yields of sugar per acre were unsatisfactory both early in the season and at later dates when normal topping gave cane of satisfactory milling quality. The unsuitability of C. P. 807 and P. O. J. 213 for early milling is indicated further by study of the analytical data secured in mid-October and early in November, which show that discarding upper portions of the stalk did not result in increasing the percentage of available sugar in the remainder of the stalk, as compared with that in the entire stalk, to the same extent secured by early-season topping of other varieties.

AVAILABLE SUGAR IN UNHARVESTED "STUBS"

Under usual harvesting conditions in Louisiana, from one to several inches of the portion of the stalk above the ground is left in the field, the height of the remaining stubble depending on the care with which the harvesting operation is performed. Aside from the loss of sugar involved, the excessive "stumpage" is believed to harbor moth borer larvae in appreciable numbers.

Immediately following the cutting of cane samples for the above-mentioned studies, as per the usual plantation practice, the remaining stubble was shaved at a depth of approximately 2 inches below the ground surface by means of a sharp knife, and the "stubs" so obtained were weighed and crushed for juice analysis. From the relationship of the weight of the cane so salvaged and that of the corresponding stalks, as previously harvested, it was possible to compute the probable weight per acre, based on the established relationship between sample weight and yield of cane per acre. Indicated yields of sugar per ton of cane were calculated from the corresponding juice analyses.

The results of above-mentioned tests are given in table 12, study of which shows that the quantity of available sugar which could be recovered from the portion of the stalk remaining in the field is sufficiently large to merit considerable attention. The juice from

recovered stubs was of comparatively high quality with indicated yields of sugar ranging from 127 to 555 pounds per acre. The quantity of available sugar per acre from the stubs of Co. 290 was consistently high and in no case fell below 300 pounds per acre. This was due in part to the relatively large quantities of cane so recovered and in part to unusually high concentration of sugar in that portion of the stalk which appears to be characteristic of the variety.

TABLE 12.—*Yields of cane and indicated yields of sugar per acre in remaining "stubs" of sugarcane* [1] *after harvest, according to common Louisiana practice*

PLANT CANE ON LIGHT SOIL

Variety	Oct. 14, 1932			Jan. 3, 1933			Oct. 13, 1933			Jan. 2, 1934		
	Cane per acre	Indicated available 96° sugar		Cane per acre	Indicated available 96° sugar		Cane per acre	Indicated available 96° sugar		Cane per acre	Indicated available 96° sugar	
		Per ton of cane	Per acre		Per ton of cane	Per acre		Per ton of cane	Per acre		Per ton of cane	Per acre
	Tons	*Lb.*	*Lb.*	*Tons*	*Lb.*	*Lb.*	*Tons*	*Lb.*	*Lb.*	*Tons*	*Lb.*	*Lb.*
P. O. J. 213	1.09	185.7	202	0.95	190.4	181	1.17	186.8	219	1.23	209.4	258
P. O. J. 234	1.07	201.8	216	1.02	189.4	193	1.09	208.2	227	1.18	226.3	267
Co. 281	1.52	218.1	332	1.35	140.2	189	1.36	200.3	272	1.68	247.3	415
Co. 290	1.78	221.2	394	1.74	216.6	377	1.71	223.0	381	2.22	249.8	555
C. P. 807	2.46	169.7	417	1.66	169.8	282	1.18	174.4	206	1.44	224.0	323
C. P. 28/19	------	------	------	------	------	------	1.06	220.3	234	1.48	256.4	379
FIRST STUBBLE ON LIGHT SOIL												
P. O. J. 213	1.06	200.1	212	0.72	176.9	127	1.64	158.5	260	1.53	199.2	305
P. O. J. 234	.85	208.8	177	.71	193.4	137	1.56	142.2	222	1.33	196.8	262
Co. 281	1.22	219.7	268	1.09	212.8	232	1.40	203.1	284	1.48	234.2	347
Co. 290	1.65	236.0	389	1.39	216.6	301	1.68	222.7	374	1.80	261.3	470
C. P. 807	1.44	195.2	281	1.28	193.6	248	1.59	169.7	270	1.45	200.0	290
C. P. 28/19	------	------	------	------	------	------	1.07	227.3	243	1.59	255.6	406

[1] "Stubs" cut 2 inches below ground surface.

The question of utilizing the portion of the stalk below the usual point of cutting presents many problems, several of which have not been sufficiently investigated to justify definite recommendations. There appears to be no reason why the stalk should not be cut at least as low as the ground surface, since the portion above the ground is almost invariably killed back by winter freezes and, therefore, serves no useful purpose with the succeeding crop. On the contrary, it is frequently a serious impediment to proper cultivation. The high quality of the juice from this part of the stalk renders its utilization extremely desirable. An important question in connection with cutting the cane below the ground surface is the possible effect on the growth of the succeeding crop. It is conceivable that removal of such a large portion of the stubble might have a harmful effect either as the direct result of the reduction in number of buds and amount of plant food or, possibly, as the indirect result of a greater chance of loss of lower buds, due to their becoming infected by deleterious organisms. On the other hand, removal of buds above and immediately below the ground surface might prove beneficial by keeping the stubble more nearly dormant during the winter, with resulting reduction in the extent of sporadic growth and corresponding conservation of plant food until the advent of favorable growing conditions in the spring. Preliminary observations did not reveal any measurable difference between the succeeding crop from stubbles in which the stalks had been cut approximately 2 inches below the ground

surface and the crop from stubbles in which the stalks had been cut in accordance with the usual plantation procedure. The tests, however, were not sufficiently extensive to be considered conclusive. The problem of satisfactorily cutting cane below the ground surface presents mechanical difficulties which would likewise have to be solved.

In these studies no attempt was made to differentiate between the proportions of the recovered stumpage above and below the ground surface. In limited studies conducted at the field station and on a nearby plantation during the fall of 1934, the cane recovered from portions of the stumps above the ground, following the harvest of cane in the usual manner, ranged from 0.12 to 0.68 of a ton per acre, the actual quantity depending on the stand of cane, the variety, and the care with which the harvesting operation was performed. The indicated yield of sugar per acre from the salvaged stumps ranged from 25 to 136 pounds. In addition to the well-recognized cultivation difficulties resulting from high-cut stubble, the quantity of sugar per acre thus wasted in extreme cases is sufficiently large to merit serious consideration. In addition, with properly cut cane, the necessity for stubble shaving during the following spring is largely removed.

SUMMARY

Results of extensive experimental studies, throughout the harvesting seasons of 1932–33 and 1933–34, of the ripening of important varieties of sugarcane grown in Louisiana and of the effect of removal of varying proportions of the immature upper portion of the stalk on yields of sugar per ton of cane and per acre, are presented in this circular. They disclose the existence of important varietal characteristics with respect to comparative rate of ripening and to relative concentration of sugar in different sections of the stalk at various dates throughout the harvesting season. An understanding of this tendency, particularly at relatively low levels of ripeness occurring early in the season, is not only of great importance in connection with the commercial culture of sugarcane, but appears essential if cane of the greatest possible commercial value is to be secured.

Data secured at periodic intervals show that considerable gains in yield of cane per acre and indicated yields of sugar per ton of cane are usually made by sugarcane between October 15 and the date at which progress in growth and ripening is usually interrupted by freezing temperatures. The extent of the gains in sugar in the case of different varieties depends to a large extent on their inherent maturing characteristics. Following temperatures below 32° F., the extent of succeeding gains depends to a large extent on the varietal reaction to low temperatures. The outstandingly early ripening quality of C. P. 28/19 is clearly shown, indicated yields of sugar per ton of cane from this variety having consistently compared favorably with, or having exceeded, those from P. O. J. 234, and having proved superior to yields from Co. 281, Co. 290, and other varieties. However, under comparable conditions, Co. 281 and Co. 290 showed less apparent injury from a minimum temperature of 27° F. on November 13, 1932, than any other varieties, while in the average of all tests following a minimum temperature of 24.5° F. on December 17, 1932, Co. 290 showed more severe deterioration than any other variety.

The comparatively late ripening qualities of Co. 281 and Co. 290, as shown by the low concentration of sugar in the upper part of the

stalk early in the harvesting season, indicate the unsuitability of these varieties for very early harvesting when the cane is topped in accordance with the usual practice followed in Louisiana. However, the high concentration of sugar in the lower part of the stalks of these varieties, even very early in the season, together with their high yields of cane per acre, indicate the feasibility of harvesting them early in the season at a sacrifice of a considerably larger proportion of the top than is ordinarily discarded. At the same level of percentage of juice from whole stalks, the varieties Co. 281 and Co. 290, in comparison with other varieties, almost invariably showed lesser concentration of sugar in the upper portion of the stalk and greater concentration in the lower portion. By discarding varying proportions of the upper immature portions, ranging from 10 to 30 percent of the weight of the cane, on any of the dates of analysis during October and November it was possible to obtain cane of a quality as high as, or higher than, that from P. O. J. 234 or C. P. 28/19 under comparable conditions, as measured by the indicated yield of sugar per ton of cane. Under such conditions of topping, the indicated yields of sugar per acre from Co. 290 were much greater than these from P. O. J. 234 in all instances and greater than those from C. P. 28/19 in many instances.

Results with C. P. 807 and P. O. J. 213 indicate that these varieties are, in general, unsuitable for early harvesting. P. O. J. 213 not only ripened at a slow rate but usually gave unsatisfactory yields of cane and of sugar per acre. In 1932 C. P. 807 first stubble proved comparatively mature, topping in accordance with usual plantation practice even as early as October 14 having given cane of high milling quality and satisfactory yields of sugar per acre, but in the case of all other tests the relative immaturity of the cane in mid-October and early in November was such that even extensive topping did not sharply increase the percentage of sugar in the remainder of the stalk as compared with that in the whole stalk. However, by mid-November normal topping or, at most, only minimum excess topping of this variety gave cane of high milling value and, due to its excellent yields of cane per acre, resulted in satisfactory indicated yields of sugar per acre.

Experimental studies of the weight of the "stubs" remaining in the field following harvesting of cane in accordance with the usual plantation practice in Louisiana and of the percentage of sugar in them, show the high value of this material, indicated yields of sugar per acre from "stubs" cut 2 inches below the ground surface having ranged from 127 to 555 pounds and yields from Co. 290 having in no case fallen below 300 pounds. Limited studies conducted in 1934 showed an indicated yield of sugar from that portion of the "stubs" above the surface of the ground ranging from 25 to 136 pounds per acre. The data indicate that yields of sugar per acre could be materially increased by cutting the cane lower, and suggest the importance of investigating the feasibility of utilizing portions of the stalk which are ordinarily left in the field when cane is harvested in the usual manner.

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